Systematic Review of Southeast Asian Longtail Macaques, *Macaca fascicularis* (Raffles, [1821])

Jack Fooden

Abstract

The longtail macaque, *Macaca fascicularis* (Raffles, [1821]), is systematically reviewed, based on examination of 2,049 museum specimens, study of relevant literature, and observation of natural populations. *Macaca fascicularis* inhabits tropical Southeast Asia, where its natural range extends from southernmost Bangladesh to the Philippines and from islands west of Sumatra to Timor. This review of *M. fascicularis* includes analyses of geographic variation in pelage characters, external measurements and proportions, cranial characters, molecular and genetic characters, and disease susceptibility. Evidence concerning natural history, reproduction, and paleontology also is investigated. Ten subspecies of *M. fascicularis* are recognized, and a key to these subspecies is provided. Subspecies accounts present synonymies, type and type locality information, geographic distributions, and diagnoses. Six hypothetical stages in the evolution and dispersal of this species are proposed and discussed. An annotated gazetteer lists approximately 1,150 localities at which *M. fascicularis* has been collected or observed.

Introduction

Macaca fascicularis (Raffles, [1821]) is widely distributed in mainland and insular Southeast Asia from approximately 21°N to 10°S latitude and from 92°E to 126°E longitude (Fig. 1). Vernacular names applied to this species include crab-eating, cynomolgus, kra, and longtail macaque. The natural abundance of *M. fascicularis* is indicated by the large number of specimens in museum collections (Appendix 1), which greatly exceeds that of any other species of macaque.

The existence of this species was first made known to Western science by the English seaman W. Dampier (1697, p. 220) and the German missionary G. J. Camel (in Petiver, 1705, p. 2199), both of whom observed *M. fascicularis* in the Philippines. The name "macaque" was first applied to this monkey by Buffon (in Buffon & Daubenton, 1766, p. 190), based on an imported specimen of unknown origin.

The present review of *Macaca fascicularis* is based on examination of 2,049 museum specimens (Appendix 1), survey of relevant literature, and observation of natural populations in Thailand and Bali. Specimens examined are preserved in the following institutions, which hereafter are cited by means of the following abbreviations:

AIUZ	Anthropologisches Institut der Universität Zürich
AMNH	American Museum of Natural History, New York
ANSP	Academy of Natural Sciences, Philadelphia
BM(NH)	British Museum (Natural History), London
BNHS	Bombay Natural History Society, Bombay
CTNRC	Centre for Thai National Reference Collections, Thailand Institute of Scientific and Technological Research, Bangkok
FMNH	Field Museum of Natural History, Chicago
IRSN	Institut Royal des Sciences Naturelles de Belgique, Brussels
MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts

MMNH	Bell Museum of Natural History, University of Minnesota, Minneapolis
MNHN	Muséum National d'Histoire Naturelle (Mammifères), Paris
MZB	Museum Zoologicum Bogoriense, Bogor
NHMBa	Naturhistorisches Museum, Basel
NHMBe	Naturhistorisches Museum, Bern
NHRM	Naturhistoriska Riksmuseet, Stockholm
NMS	Natur-Museum Senckenberg, Frankfurt
PNM	Philippine National Museum, Manila
PRI	Primate Research Institute, Kyoto University, Inuyama
RCS(OM)	Royal College of Surgeons, Odontological Museum, London
RMNH	Rijksmuseum van Natuurlijke Historie, Leiden
SICONBREC	Simian Conservation, Breeding & Research Center, Inc., Tanay, Luzon
SMK	Sarawak Museum, Kuching
SMTD	Staatliches Museum für Tierkunde, Dresden
UMMZ	Museum of Zoology, University of Michigan, Ann Arbor
UPLBCF	University of the Philippines at Los Baños, College of Forestry, Los Baños, Luzon
UPLBZD	University of the Philippines at Los Baños, Zoology Department, Los Baños, Luzon
USNM	National Museum of Natural History, Washington, D.C.
ZLUU	Zoological Laboratory of Utrecht University, Utrecht
ZMB	Zoologisches Museum des Humboldt-Universität, Berlin
ZMUZ	Zoologisches Museum der Universität Zürich
ZRC	Zoological Reference Collection, Department of Zoology, National University of Singapore
ZSBS	Zoologisches Sammlung des Bayerischen Staates, Munich
ZSI	Zoological Survey of India, National Zoological Collection, Calcutta

Geographic names used in this review generally are officially approved names. However, the following conventional names are retained because of their greater familiarity (alternative names in parentheses): Burma (Myanmar), Java (Jawa), Lesser Sunda Islands (Nusa Tenggara), and Sumatra (Sumatera). Cited geographic names frequently include the following generic terms: gunong (Malaysian) or gunung (Indonesian) = mountain; ko (Thai) = island; pulau (Malaysian and Indonesian) = island; and teluk (Indonesian) = bay.

This review begins with a general account of the geographic distribution of *M. fascicularis*. Following are discussions of (1) pelage characters, (2) external measurements and proportions, (3) cranial characters, (4) molecular and genetic characters, and (5) disease susceptibility; these discussions emphasize patterns of geographic variation. Subsequent sections summarize available information concerning natural history, reproduction, and paleontology. A discussion of subspecific taxonomy, supplemented by a key to recognized subspecies, is based on material presented previously. For each recognized subspecies, a formal subspecies account provides the following: annotated synonymy; information concerning types, type locality, and distribution; subspecific diagnosis; and summary of specimens examined (complete list in Appendix 1). The final section of this review presents a hypothetical interpretation of the evolution and dispersal of *M. fascicularis*.

Geographic Distribution

Macaca fascicularis inhabits tropical Southeast Asia (Figs. 1, 2). Its natural geographic range extends from southernmost Bangladesh and southern Burma southward and eastward through the southern part of the Indochinese Peninsula (south of 17°N), the Isthmus of Kra, the Malay Peninsula, Sumatra, Borneo, Java, and the Lesser Sunda Islands as far east as Timor, the Philippine Islands, and numerous small adjacent islands, including the southernmost three Nicobar Islands.

The presence of *M. fascicularis* in some islands in Southeast Asia has been attributed to prehistoric human introduction (see below, Fossils and Subfossils; Evolution and Dispersal). During historic times, successful introductions have occurred in Mauritius Island (I.), east of Madagascar, probably in the sixteenth century (Sussman & Tattersall, 1986, p. 30); southwestern Sulawesi, date unknown (Müller, [1840], p. 17; M. Weber, 1890b, p. 102; Dammerman, 1929, p. 6); Anguar Island, north of New Guinea, early twentieth century

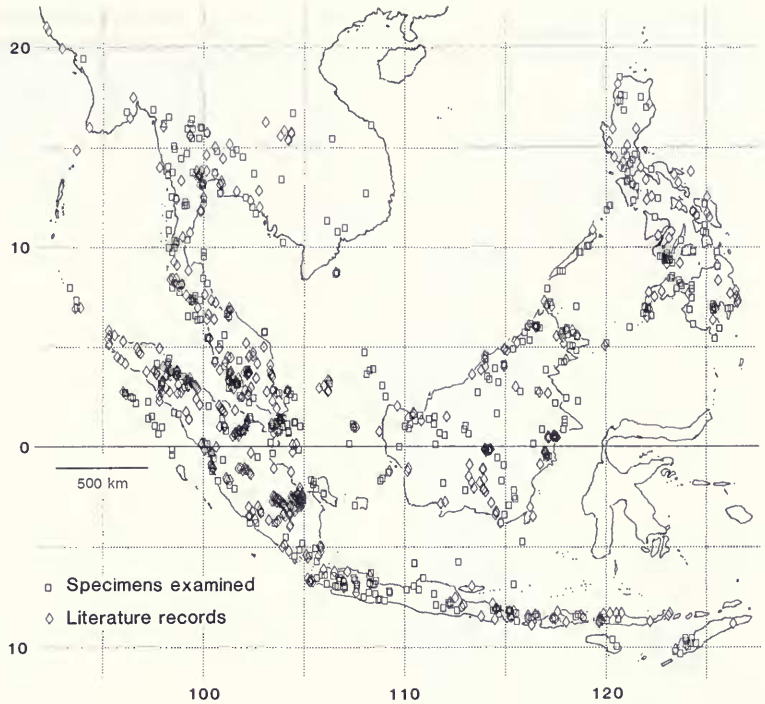

FIG. 1. Known locality records of *Macaca fascicularis*. For details, see Figure 2A–C.

(Poirier & Smith, 1974, p. 264); Hong Kong, ca. 1945 (Marshall, 1967, p. 44; Southwick & Manry, 1987, p. 48); and Pulau (P.) Tinjil, south of western Java, 1988–1990 (Kyes, 1993, p. 78).

Physiographically, the geographic range of *M. fascicularis* includes mainland Southeast Asia, shallow-water islands on the Sunda Shelf, and deep-water islands at or beyond the edge of the Sunda Shelf (Figs. 3, 4). During the most recent glacial maximum, ca. 18 Ka, sea level was reduced by about 120 m, which exposed most of the Sunda Shelf and extended mainland Southeast Asia to include Sumatra, Borneo, Java, and other shallow-water islands (Heaney, 1986, p. 131; 1991a, p. 56). During the preceding glacial maximum, ca. 160 Ka, sea level may have been reduced by about 170 m, which exposed more of the Sunda Shelf but still left most deep-water islands isolated.

To facilitate zoogeographic analysis, in subsequent discussions of geographic variation the range of *M. fascicularis* is subdivided into three components: (1) a core area of distribution that comprises mainland Southeast Asia, Sumatra, Borneo, and Java, four large landmasses that were interconnected by dry land ca. 18 Ka; (2) shallow-water fringing islands—small islands within the 120-m bathymetric line that have been isolated from the core area for less than 18 K years; and (3) deep-water fringing islands—islands beyond the 120-m bathymetric line that have been isolated from the core area at least since the beginning of the preceding interglacial, ca. 120 Ka (Van Couvering & Kukla, 1988, p. 461) and that may never have been joined to the core area.

Pelage

General Characterization (Fig. 5)

Dorsal pelage color in *M. fascicularis* varies from buffy to yellowish gray to golden brown to reddish brown to blackish. Individual hairs generally are conspicuously marked by one or two pale subterminal bands that vary in color from pale yellowish to golden to rufescent. The crown usually is more brightly colored than the back (pale subterminal bands more conspicuous in crown hairs), but in some specimens the crown is contrastingly darker and duller than the back (pale subterminal bands reduced or absent in crown hairs). The anterior edge of the crown is bordered by a transverse blackish supraorbital streak; hairs at the vertex

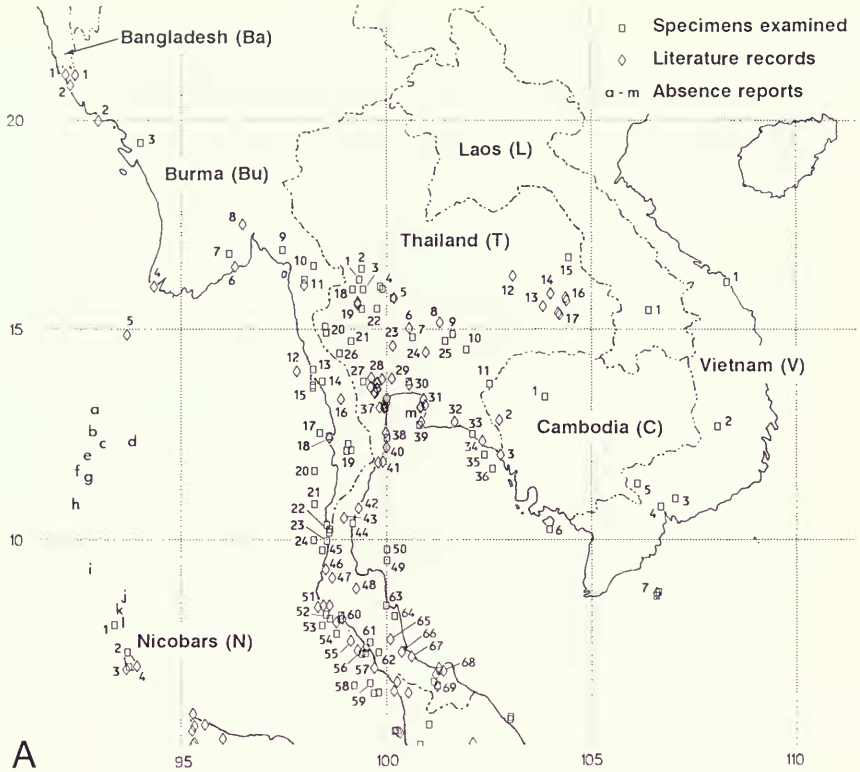

FIG. 2A. Detail map of non-Philippine localities of *Macaca fascicularis,* northwestern quadrant. (Philippine localities are mapped in Fooden, 1991, p. 2.) For documentation, see Gazetteer (Appendix 2). Abbreviations in parentheses are those used in Gazetteer locality codes.

Bangladesh (Ba)

1. Bilasodia; Bimirdia; Ghorardia; Ochodia; Rukumodia.
2. Jolir dia.

Burma (Bu)

1. Lal char.
2. Myengun Kyun.
3. Arakan Division.
4. Hainggyi Kyun.
5. Preparis Island.
6. Desertion Creek.
7. Rangoon.
8. Pegu.
9. Wimpong.
10. Haungtharaw.
11. Ataran River; Ye Forest.
12. Moscos Island Game Sanctuary.
13. Tavoy River.
14. Taungbyauk Chaung.
15. Kathema Kyun; Mibya Kyun.
16. Kaser Doo Wildife Sanctuary.
17. Kadan Kyun.
18. Great Tenasserim River; Mergui.
19. Tagoot; Tenasserim; Thagyet.
20. Letsok-aw Kyun.
21. Lanbi Kyun.
22. Ban Sadein; Pakchan River, near Bankachon; Pakchan River, near Maliwun.
23. Ru, Pulo.
24. Zadetkyi Kyun.

Cambodia (C)

1. Siemreab.
2. Pang Roloem-Sur Sdei area.
3. Laem Ngop-Phumi Cham Yeam (Cambodia or Thailand).

Laos (L)

1. Thateng, Muang.

Nicobars (N)

1. Ol-kolo-kwak vicinity.
2. Little Nicobar.
3. Kopenheat; Pulo Nyur.
4. Campbell Bay vicinity.

Thailand (T)

1. Ban Nam Lai Tai.
2. Ban Mae Na Ree.
3. Wong, Nam Mae, 53 mi (= 85 km) E of Um Pang.
4. Ping, Mae Nam; Wat Khao Noh.
5. Ban Pak Nam Pho; Wat Krieng Krai Klang.
6. Wat Khao Wong Kot.

often form an irregular tuft or crest. Hairs on the side of the head are pale ochraceous gray to pale ochraceous brown and form a variably prominent lateral facial crest that usually extends from near the angle of the jaw to the crown, but may be restricted to the mandibular region. The face generally is thinly haired; the facial skin is brownish to pinkish, except for the upper eyelids, which are sharply defined whitish. On the limbs, the proximal part of the outer surface is approximately the same color as the adjacent surface of the trunk. More distally, the outer surface of the limbs becomes paler, pale grayish to pale golden brown at the wrists and ankles. The dorsal surface of the tail is golden brown to blackish basally, becoming paler (pale grayish to grayish brown) distally. Pelage on the ventral surface of the trunk, limbs, and tail is thin and pale gray to whitish.

←

7. Sarn Pra Karn.
8. Wat Khao Sompoad.
9. Lat Bua Khao.
10. Ban Sakaerat.
11. Aranyaprathet.
12. Kosumphi Forest Park.
13. Wat Koo Pra Kona.
14. Ban Kosum.
15. Phu Phan.
16. Don Poo Tao; Prang Koo.
17. Ban Wan; Wat Ban Kan Yai.
18. Wong, Nam Mae, 40 mi (= 65 km) E of Um Pang.
19. Kata Taek; Sap Khao; Thap Salao, Huai.
20. Ban Tamrong Phato; Khwae Noi, Mae Nam.
21. Ban Phu Toie.
22. Khao Phatowee.
23. Wat Noi Chompoo.
24. Wat Phra Buddha Chai.
25. Pak Chong, Sathani.
26. Ban Huai Maenam Noi.
27. Siam, 13°45′N, 99°25′E.
28. Khao Suan Luang; Tham Chomphon; Wat Cha-Am Kiri; Wat Huai Takhaeng; Wat Khao Chong Phran; Wat Khao Khan Hok; Wat Khao Yod Thong; Wat Ngern Rung Sawang; Wat Ratch Singkhorn; Wat Tham Kunchhorn.
29. Wat Tham Sala.
30. Bangkok; Chao Phraya, Mae Nam.
31. Khangkhao, Ko; Samuk, Khao; Si Chang, Ko; Si Racha vicinity.
32. Wang Kaew.
33. Laem Sing mountains.
34. Ven-Ven.
35. Chang, Ko.
36. Kut, Ko.
37. Khao Wang; Phet Buri; Samut Songkhram vicinity; Wat Ban Rai Don; Wat Bun Thawi; Wat Khao Bandai It; Wat Khao Takhrao; Wat Khao Tamon; Wat Kut.
38. Pran Buri, Mae Nam.; Wat Khao Takieb.
39. Khram Yai, Ko; Klet Kaeo, Ko.
40. Khao Sam Roi National Park.
41. Prachuap Khiri Khan, few miles north; Wat Thammikaram Varavihārn.
42. Wat Tham Khao Phlu.
43. Wat Tha Mai Lai.
44. Chumphon, Khlong.
45. Phayam, Ko.
46. Laem Son National Park.
47. Chiew Larn Reservoir.
48. Thung Thong Waterfowl Reserve.
49. Khlong Pah Yie, Ko Samui.
50. Phangan, Ko.
51. Khao Lampi-Hat Thai Muang National Park; Phangnga Bay National Park; Wat Tham Suwan Khuha.
52. Na Ka Yai, Ko; Yao Noi, Ko.
53. Rang Yai, Ko.
54. Phi Phi Don, Ko.
55. Lanta Yai, Ko.
56. Ban Phra Muang; Hat Chao Mai National Park; Kantang; Muk, Ko; Talibong, Ko.
57. Mu Ko Phetra National Park.
58. Butang, Ko.
59. Telok Wau, Ko Tarutao.
60. Ban Nong Kok; Ban Nong Put; Ban Thap Plik, 1 km NE; Hat Noppharat Thara-Mu Ko Phi Phi National Park; Tham Hom; Wat Tham Sua.
61. Tyching.
62. Khao Rang Kai.
63. Nakhon Si Thammarat.
64. Ban Na.
65. Wat Khuha Sawan; Wat Suwankuha.
66. Nang Kham, Ko.
67. Khao Noi/Khao Tangkuan.
68. Nong Chik region; Pattani; Pho, Laem; Yaring, tidal creeks near; Yaring region.
69. Ban Sai Kau; Kampong Biserat; Wat Khuha Phimuk.

Vietnam (V)

1. Sontra Peak.
2. Lac Giao.
3. Xa Trang Bom.
4. Ho Chi Minh City.
5. Tay Ninh.
6. Phu Quoc Dao.
7. Airfield building vicinity, Con Son; Ben Dam vicinity, Hon Ba; Con Son.

Absence reports

a. North Andaman Island.
b. Middle Andaman Island.
c. Henry Lawrence Island.
d. Barren Island.
e. South Andaman Island.
f. Little Jolly Boy Island.
g. Rutland Island.
h. Little Andaman Island.
i. Car Nicobar Island.
j. Tillanchong Island.
k. Camorta Island.
l. Nancowry Island; Trinkat Island.
m. Phai, Ko.

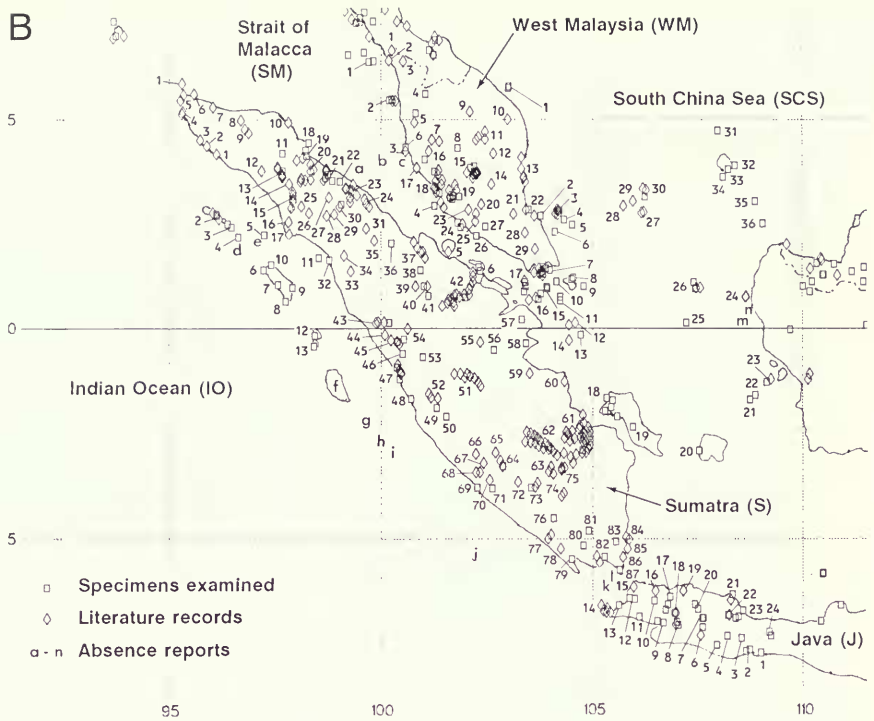

FIG. 2B. Detail map of non-Philippine localities of *Macaca fascicularis,* southwestern quadrant. (Philippine localities are mapped in Fooden, 1991, p. 2.) For documentation, see Gazetteer (Appendix 2). Abbreviations in parentheses are those used in Gazetteer locality codes.

Indian Ocean (IO)

1. We, Pulau.

Simeulue, Pulau:
2. Dalam, Lhok; Sibaboh, Lugu; Survey Site LB; Survey Site LS; Survey Site SEM.
3. Ajer Dingin; Labuhanbajau; Sinabang.
4. Lasia, Pulau.
5. Tuangku, Pulau.

Nias, Pulau:
6. Lafau.
7. Soliga.
8. Hilisimaetano.
9. Samasama.
10. Siaba, Teluk.
11. Mursala, Pulau.
12. Tanahmasa, Pulau.
13. Tanahbala, Pulau.

Java (J), including nearby islands

1. Cilacap.
2. Kalipucang; Pangandaran.
3. Tjeringin.
4. Tasikmalaya.
5. Tilu, Gunung.
6. Malabar; Preanger district.
7. Bandung, 2000 ft; Bandung, near.
8. Ciwangi; Singkil, Gunung; Takokak Reserve.
9. Bantargebang; Pelabuhanratu, Teluk.
10. Jasinga.
11. Cihara.
12. Sarongen; Tamandjaija.
13. Camara.
14. Handeuleum, Pulau; Niur; Panaitan, Pulau; Peucang, Pulau; Ujungkulon, Suaka Margasatwa.
15. Danau, Rawa.
16. Gunung Halimun Reserve.
17. Bogor; Depok; Salak, Gunung.
18. Gede, Gunung; Pangrango, Gunung.
19. Cikarang forest.
20. Cikujang; Pasir Carolina.
21. Indramayu; Jatibarang.
22. Majalengka; "P. Sember."
23. Cirebon; Ciremay, Gunung; Linggajati.
24. Baturaden; Kaligoea.

South China Sea (SCS)

1. Pinang, Pulau [2]; Redang, Pulau.
2. Acheh, Pulau.
3. Pulau Tioman: Camp II, Juara side; Juara, Telok; Kampong Mukut; Nipah, Telok, vicinity; Sedagong; Tekek.
4. Pemanggil, Pulau.
5. Aur, Pulu.
6. Tinggi, Pulau.
7. Sentosa Island; Singapore Island: Bukit Timah Nature Reserve; Changi; MacRitchie Reservoir Nature Reserve; northwestern part; Pandan, Sungai; Punggol; Sembawang, Sungai; Singapore Botanical Gardens; western part.

←

8. Pulau Bintan: north coast; Pasir Panjang; Sungei Biru.
9. Mentigi, Pulau Mapur.
10. Tanjong Sauh, Pulau Batam.
11. Galang, Pulau; Nguwal, Pulau.
12. Bakung, Pulau; Sebangka, Pulau.
13. Lingga, Pulau.
14. Selayar, Pulau.
15. Bulan, Pulau, south.
16. Durian, Pulau; Durian-kecil, Pulau; Sugi, Pulau; Ungar, Pulau.
17. Karimun-kecil, Pulau; Selatbliat, Pulau Kundur; Pulau Karimun: Mensuda Bay; Monos; Pemeral; Pongka, Kampung.

Bangka, Pulau:

18. Jebus; Muntok; Pamuja, Tanjung; Rengsam, Tanjung; Simpang.
19. Sungaiselan.
20. Batu, Tanjung, Pulau Belitung.
21. Serutu, Pulau.
22. Pai, Teluk, Pulau Karimata.
23. Pelapis Tengah, Pulau; Penebangan, Pulau.
24. Lemukutan, Pulau.
25. Pejantan, Pulau.
26. Benua, Pulau; Jela, Pulau; Selintang, Pulau; Tambelan Besar, Pulau; Uwi, Pulau.
27. Airabu, Pulau; Piling, Pulau.
28. Jemaja, Pulau.
29. Telaga, Pulau.
30. Matak, Pulau; Mubur, Pulau; Siantan, Pulau.
31. Laut, Pulau.

Natuna Besar, Pulau:

32. Ulu, Sungai.
33. Binjai, Sungai.
34. Lagong, Pulau.
35. Subi-kecil, Pulau.
36. Serasan, Pulau.

Strait of Malacca (SM)

1. Burau, Pulau; Langkawi, Pulau.
2. Pulau Pinang [1]: Pantai Krachut; Penang Botanical Gardens; Penang Hill; Telok Bahang.
3. Pangkor, Pulau.
4. Pintu Gedong, Pulau.
5. Rupat, Pulau.
6. Kapos Tinggi, Pulau Bengkalis; Padang, Pulau, north coast.

Sumatra (S)

1. Meulaboh vicinity.
2. Meulaboh, ca. 35 km NW.
3. Meulaboh, ca. 60 km NW.
4. Banda Aceh, ca. 40 km S and 45 km S.
5. Banda Aceh, near and ca. 20 km SSW.
6. Banda Aceh, ca. 30 km ENE.
7. Banda Aceh, ca. 85 km ESE.
8. Takengon, ca. 40 km NNW.
9. Bur ni Bebuli; Takengon, ca. 15 km NNW.
10. Lhokseumawe, 80 km ESE.
11. Lesten.
12. Gunung Leuser Reserve.
13. Alas, Lae, between Agusan and Ketambe Research Station; Goenoengsetan-Meloewak; Gumpang, near; Ketambe Research Station; Ketambe, ca. 5 km S and 10 km S.
14. Ketambe, ca. 30 km SSE.
15. Alas, Lae, between Muara Setulen and Lae Renun, between Lae Renun and Bengkong River, and between Bengkong River and Gelombang; Bukit Lawang, ca. 35 km SW; Renun, Lae.
16. Alas, Lae, between Gelombang and mouth of river.
17. Singkel vicinity.
18. Tamiang.
19. Medan, ca. 75 km NW; Pangkalansusu; Serangjayahilir; Sikundur.
20. Bukitlawang; Bukitlawang, Area I and Area II; Bungara, Area III; Ober Langkat district; Serapit Tandjung; Tandjung Bringin; Tandjung Butus; Unter Langkat district.
21. Batangkuis; Belawan; Deli, Sungai; Labbuhandeli vicinity; Medan, forest near, near sea level, and vicinity; Medan, 20 km N; Medan-Siantar; Tanjungmorawa; Terbanjawan.
22. Serdang district.
23. Batu Bara district; Lauttador; Padang/Bedagei district; Paguruan; Tandjung; Tebingtinggi vicinity, ca. 25 km SSE and ca. 35 km ESE.
24. Tebingtinggi, ca. 55 km ESE and ca. 65 km and 75 km SE.
25. Bukitlawang, ca. 65 km S.
26. Medan, ca. 100 km SSW.
27. Dolok Tinggi Radja Reserve.
28. Medan, ca. 105 km SSE.
29. Tebingtinggi, ca. 75 km SSW.
30. Pematangsiantar; Tebingtinggi, ca. 60 km SSW.
31. Batang Garut.
32. Tapanuli, Teluk.
33. Padangsidempuan vicinity.
34. Padangsidempuan, ca. 45 km NNW.
35. Rantauprapat vicinity.
36. Telukpanji.
37. Bangko, ca. 15 km, 20 km, and 25 km ENE, ca. 20 km N, and ca. 30 km NNW.
38. Rokan-kanan, Sungai.
39. Bangko, ca. 80 km S.
40. Bangko, ca. 90 km SSE; Pagansan; Pap-ka; Siak Copatta; Sumatra, east-central.
41. Tapung-kanan, Sungai.
42. Gasip, Sungai, ca. 10 km and 20 km above mouth; Mandau, Sungai; Mempura; Perawang, 4 km NW; Siak, Sungai, near Pekanbaru, ca. 15 km, 30 km, 45 km, 60 km, and 75 km below Pekanbaru, ca. 60 km, 48 km, 36 km, 24 km, and 12 km above mouth, and near mouth.
43. Lubuksikaping; Pinagar; Pinagar, ca. 5 km SW and ca. 20 km E.
44. Bukit Cangang.
45. Bukittinggi and vicinity and ca. 20 km S; Maninjau; Payakumbuh.
46. Pajo.
47. Lubukminturun area; Meru, Gunung; Padang; Pangkalan; Pasar Usang area; Sungailundang; Tarusan, Teluk.
48. Kambang.
49. Siulakderas.
50. Sandaran Agong.

←

51. Telukkayubutih vicinity, ca. 15 km E, ca. 15 km NNE, ca. 15 km and 30 km WNW, ca. 30 km and 45 km ESE, and ca. 60 km SE.
52. Kerinci, Gunung, northern foot; Pakan Selasa and ca. 10 km SSE.
53. Sijunjung.
54. Landai vicinity.
55. Japura.
56. Indragiri district.
57. Kateman, Sungai.
58. Indragiri, Sungai.
59. Jambi, ca. 60 km NNW.
60. Jambi, ca. 90 km ENE.
61. Musi, Air, ca. 30 km and 15 km above Palembang, near Palembang, and ca. 12 km, 24 km, 36 km, 48 km, 60 km, 72 km, and 84 km below Palembang; Palembang district; Palembang, ca. 30 km, 40 km, 45 km, 50 km, 65 km, 70 km, 80 km, and 100 km N, ca. 30 km and 60 km NNE, ca. 40 km, 60 km, 65 km, and 70 km NNW, ca. 45 km and 60 km NW, and ca. 35 km SW.
62. Harileko, Batang, ca. 12 km, 24 km, 36 km, 48 km, 60 km, 72 km, 84 km, and 96 km above mouth; Musi, Air, ca. 15 km, 30 km, 45 km, 60 km, 75 km, and 90 km above mouth of Batang Harileko; Musi, Air, ca. 50 km, 70 km, and 85 km above Palembang.
63. Palembang, ca. 95 km and 100 km SW and ca. 90 km WSW.
64. Lubuklinggau and vicinity and ca. 15 km N.
65. Lubuklinggau, ca. 40 km NNW.
66. Barisan Selatan.
67. Kelabong, Bukit, vicinity.
68. Jeleket vicinity and ca. 10 km W.
69. Bengkulu.
70. Bengkulu, ca. 40 km ENE.
71. Sanggul, Bukit.
72. Lubuklinggau, ca. 60 km SE.
73. Baturaja, ca. 70 km WNW and ca. 75 km NW; Lahat.
74. Baturaja, ca. 20 km and 30 km NNE.
75. Palembang, ca. 60 km, 65 km, and 70 km SW.
76. Muaradua.
77. Suka Bandjar, NE and SE.
78. Bukit Barisan Selatan, Taman Nasional.
79. Wonosobo.
80. Lampung, Propinsi.
81. Kotabumi.
82. Moro Batin and SSE; Telukbetung.
83. Sukadana.
84. Sungsan, ca. 50 km N; Kambas, Wai.
85. Sungsan, ca. 20 km NNE.
86. Kiambang.
87. Kalianda.

West Malaysia (WM)

1. Kampong Titi Tinggi.
2. Perlis, Sungai.
3. Perangin, Bukit.
4. Pong.
5. Larut, Daerah; Ulu Ijok.
6. Hantu, Tanjong.
7. Cameron Highlands; Kinta, Daerah.
8. Telom, Sungai.
9. Berangkat, Gunong, east.
10. Terengganu, Sungai, vicinity.
11. Kenyam, Sungai; Negara, Taman; Tahan, Sungai; Tembeling, Sungai.
12. Sungai Tekam Forestry Concession.
13. Berapit, Bukit, east; Kampong Cherok Paloh; Kampong Tanah Puteh; Kuantan; Pekan vicinity.
14. Kertau, Bukit.
15. Benom, Gunong; Benom, Gunong, NE slope; Kuala Lompat; Kuala Lompat Post, 0–1 km NW and 0–2 km W; Lompat, Sungai, ca. 3 km and 4 km ENE of Kuala Serloh; Lompat, Sungai, ca. 3 km, 4 km, and 6 km W of Kuala Lompat Post; Patong, Bukit, ca. 1 km W; Teris, Sungai.
16. Keroh Forest Reserve; Telok Anson.
17. Morib.
18. Changkat Mentri; Cherakah, Bukit; Dusun, Sungai; Kampong Rantau Panjang; Kampong Sungai Buloh; Kuala Selangor; Kuala Selangor estuary; Lima Belas Estate; Pacific Tin; Port Swettenham vicinity; Tengi, Sungai; Tunggal, Bukit.
19. Bunga Buah; Damansara; Dusun Tua; Gaik Liew Estate; Kelang Road; Kuala Lumpur vicinity; Nanas, Bukit; Templer Park; Ulu Gombak Forest Reserve.
20. Pasoh Forest Reserve.
21. Lesong.
22. Endau, Sungai, vicinity; Kuala Rompin; Tanjong Panjair.
23. Telapak Burok, Gunong.
24. Menyala, Sungai; Port Dickson; Tanjong Tuan.
25. Kuala Pilah vicinity; Nuri Valley.
26. Melaka.
27. Nyalas.
28. Selai, Sungai.
29. Sekol, Sungai.

Absence reports

a. Berhala, Pulau.
b. Jarak, Pulau.
c. Sembilan Kepulauan.
d. Babi, Pulau.
e. Bangkaru, Pulau.
f. Siberut, Pulau.
g. Sipura, Pulau.
h. Pagai Utara, Pulau.
i. Pagai Selatan, Pulau.
j. Enggano, Pulau.
k. Anak Krakatau, Pulau; Rakata, Pulau; Rakata-kecil, Pulau; Sertung, Pulau.
l. Sebesi, Pulau.
m. Datuk, Pulau.
n. Temaju, Pulau.

Absence report not represented because of map congestion: Sanglang-besar, Pulau (0°36′–0°38′N, 103°41′–103°42′E).

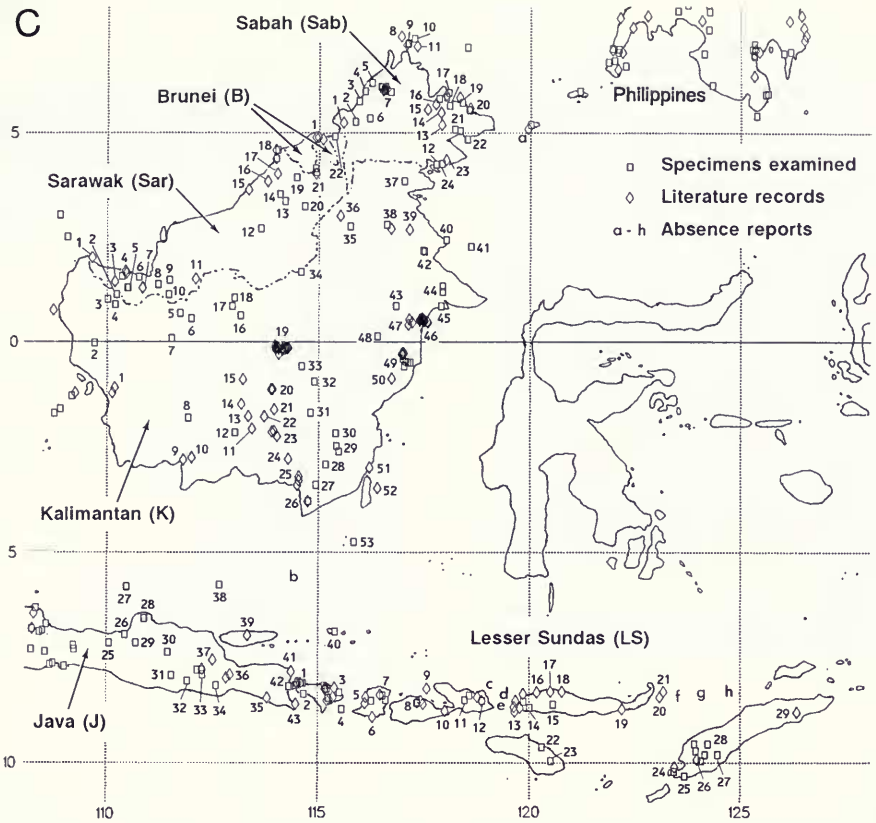

FIG. 2C. Detail map of non-Philippine localities of *Macaca fascicularis,* southeastern quadrant. (Philippine localities are mapped in Fooden, 1991, p. 2.) For documentation, see Gazetteer (Appendix 2). Abbreviations in parentheses are those used in Gazetteer locality codes.

Brunei (B)

1. Bandar Seri Begawan; Brunei Bay area; Kampong Menuggol.

Unmapped Brunei locality: Kuala Belalong Field Studies Centre (4°33′N, 115°08′E; for details, see Gazetteer, Appendix 2).

Java (J), including nearby islands
1–24. See Figure 2B.

25. Candiroto.
26. Semarang.
27. Karimunjawa, Pulau; Kemujan, Pulau.
28. Pangonan.
29. Gedangan.
30. Ngawi.
31. Tamansari.
32. Tulungagung.
33. Kawarasan; Kediri district; Margomulio, Gunung; Manggis.
34. Wonokojo.
35. Meru Betiri Nature Park.
36. Mendit; Tengger, Pegunungan.
37. Pulau Doem area.
38. Bawean, Pulau.
39. Madura, Pulau.
40. Kangean, Pulau.
41. Baluran Game Reserve.
42. Banyuwangi.
43. South Banyuwangi Nature Park.

Kalimantan (K), including nearby eastern islands

1. Cabang Panti Research Station; Gunung Palung Nature Reserve; Kampung Baru Study Area.
2. Ambawang, Sungai.
3. Senoeang.
4. Perbuah.
5. Roema Manoeal.
6. Semitau.
7. Sintang.
8. Riam.
9. Sekonyer Kanan River.
10. Tanjung Puting Reserve.
11. Katingan, Sungai, right bank, 140 km above mouth.
12. Parit.
13. Katingan, Sungai, left bank, 160 km above mouth.
14. Katingan, Sungai, left bank, 200 km above mouth.
15. Kahayan, Sungai, right bank, 180 km above mouth of Sungai Rungan.
16. Liang Koeboeng.
17. Putussibau.
18. Poelau.
19. Busang, Sungai, left bank, 6 km above mouth, and

←

right bank, 1 km above mouth; Julai, Sungai, left bank, 1 km below mouth of Sungai Busang and 2 km and 4 km above Muarajuloi; Julai, Sungai, right bank, 1 km above mouth of Sungai Busang, 3 km below mouth of Sungai Busang, and 6 km above Muarajuloi; Murung, Sungai, left bank, 1 km below mouth of Sungai Danau, 2 km above mouth of Sungai Beriwit, 2 km above mouth of Sungai Turusan, 2 km below mouth of Sungai Turusan, and 8 km above Muarajuloi; Murung, Sungai, left bank, at mouth of Sungai Beriwit, 1 km below mouth of Sungai Beriwit, 5 km above mouth of Sungai Turusan, and 1 km below mouth of Sungai Turusan; Teluk Jolo, 12 km N.

20. Kahayan, Sungai, left and right banks, 120 km above mouth of Sungai Rungan.
21. Kahayan, Sungai, left bank, 60 km above mouth of Sungai Rungan.
22. Rungan, Sungai, right bank, 50 km above mouth.
23. Rungan, Sungai, right bank, above mouth; Kahayan, Sungai, left bank, above and below mouth of Sungai Rungan, and right bank, below mouth of Sungai Rungan.
24. Kapuas, Sungai, right bank, 25 km above mouth.
25. Barito, Sungai; Kambang, Pulau; Kaget, Pulau.
26. Pelaihari; Pleihari Tanah Laut Game Sanctuary.
27. Karangintan.
28. Rantau.
29. Hantakan; Telang.
30. Tanjung.
31. Buntok.
32. Kampong Hadjak; Muaratewe.
33. Purukcahu.
34. Tibang, Mt.
35. Badang.
36. Sungai Kayan-Sungai Mentarang Nature Reserve.
37. Sembakung, Sungai.
38. Long Peleben; Long Pangian.
39. Kaboerau.
40. Karangtigau, Tanjung.
41. Maratua, Pulau.
42. Berau, Sungai; Birang, Sungai.
43. Merah.
44. Karangan, Sungai; Pelawan, Sungai.
45. Kariorang.
46. Kutai Nature Reserve, northeast corner; Sengata; Sengata, Sungai, Kutai Reserve; Sengata, Sungai, at Mentoko camp and 1 km, 2 km, 3 km, 5 km, 7 km, 9 km, 11 km, and 13 km below; Sengata, Sungai, below Sengata village.
47. Juyan, Sungai, right bank, near mouth; Mentoko Research Center; Sengata, Sungai, right bank, 1 km below mouth of Sungai Nubung.
48. Kembangjanggut.
49. Goson Djerong, near; Jembayan, Sungai; Karangmumus, Sungai; Loa Bambam; Mahakam, Sungai, left bank, 1 km and 4 km above Sebulu; Mahakam, Sungai, north bank, above Samarinda; Mahakam, Sungai, right bank, 8 km above Sebulu and 2 km below Sebulu; Tangarveng Island.
50. Sepaku, Sungai.
51. Klumpang, Teluk.
52. Sebuku, Pulau.
53. Matasiri, Pulau.

Lesser Sundas (LS)

Bali, Pulau, including nearby islet:

1. Bali Barat National Park; Banjoe Wetan; Gilimanuk; Pulaki, Tanjung; Sendang; Trima, Teluk.
2. Jembrana.
3. Bangli, near; Batur, Gunung; Botanical Gardens; Bratan, Danau; Bratan, Gunung; Buyan, Danau-Danau Bratan region; Catur, Gunung; Desa Poetjang; Gitgit; Kukuh; Sangeh; Ubud.
4. Penida, Nusa.

Lombok, Pulau:

5. Pengsong, Gunung; Pusuk, Gunung; Suranadi.
6. Kuta.
7. Pusuk forst; Rinjani, Gunung; Sewela.

Sumbawa, Pulau, including nearby islet:

8. Ai Beta; Batudulang; Maman; Semongkat.
9. Moyo, Pulau.
10. Ampang area.
11. Dompu; Oo vicinity.
12. Ntori; Raba; Rite.

Flores, Pulau, including nearby islets:

13. Ginggo, Teluk, Pulau Rinca; Kode, Nusa; Mangiatan, Pulau; Mbura, Pulau Flores; Nanga Look, Pulau Flores; Seraya Besar, Pulau.
14. Sano, Wai.
15. Rana Mese.
16. Bari.
17. Reo.
18. Pota.
19. Sika.
20. Solor, Pulau.
21. Adonora, Pulau.

Sumba, Pulau:

22. Payeti-Kambaniru.
23. Mao Marroe.

Timor, Pulau, including nearby islets:

24. Kambing, Pulau; Oeassa vicinity, Pulau Semau.
25. Amarassie.
26. Benu; Bokong; Kuatnana; Lelogama; Timau, Fatu.
27. Nikiniki.
28. Mutis, Gunung.
29. Fatuboi.

Philippines

Unnumbered locality: Bongao Peak, Bongao Island (5°01′N, 119°45′E; for details, see Gazetteer, Appendix 2).

Sabah (Sab)

1. Padas Bay.
2. Rayoh.
3. Papar.
4. Bongkabong; Rugading.
5. Talibang; Tuaran; Tuaran-Kampong Tenghilan Road.
6. Keningau.
7. Garau; Kampong Bundu Tuhan; Kampong Kiau; Kampong Kiau-Tenampok Pass; Kenokok; Kiaulan; Kinabalu, Mount; Kinabalu National Park; Lumu Lumu; Ranau; Tempasuk, Sungai; Tenompok; Tinonkok.

Sex and Age Variation

Dorsal pelage color is generally similar in adult, subadult, and juvenile males and females, but pelage in adult males tends to be longer and sleeker than in other age/sex classes. In newborn infants, dorsal pelage is blackish (on head, trunk, limbs, and tail), and the facial skin is bare, unpigmented, and pinkish (Dang, 1977, p. 11; Aldrich-Blake, 1980, p. 147; Crockett & Wilson, 1980, p. 170; Fittinghoff & Lindburg, 1980, p. 189; Wheatley, 1982, p. 205; Koyama, 1985, p. 106). The gradual transition from blackish neonatal pelage to grayish or brownish postneonatal pelage begins at about age 2–3 months, which is the age when deciduous canines and first molars erupt (Table 13) and infants begin to obtain some of their food independently (see below, Reproduction). The change of pelage color occurs first on the appendages, then on the trunk, and last on the crown. In specimens examined, the transition is complete well before eruption of the permanent first molars (age ca. 15 mo; Table 14).

Geographic Variation

DORSAL PELAGE COLOR SATURATION—To investigate geographic variation in dorsal pelage color saturation in *M. fascicularis,* specimens examined have been compared with standard skins, as in a previous study of Philippine *M. fascicularis* (Fooden, 1991, p. 5). In the previous study, the range of standard saturation index (SI) values extended from 1.0 (pale yellowish brown) to 3.0 (dark brown). In the present study, this range extends from 0.5 (buffy; FMNH 99651, Thailand: Kata Taek) to 4.0 (blackish; USNM 114168, Indonesia, P. Simeulue: Sibaboh, Lugu) (Fig. 6). Skins of infants (specimens with deciduous teeth only) are excluded from the analysis. Also excluded is the aberrantly albinistic (pale ochraceous) skin of an adult female (AMNH 107094) collected at Perbuah, northwestern Kalimantan; eight other specimens from the same locality are normally colored.

In the core area of distribution of *M. fascicularis* (see above, Geographic Distribution), dorsal pelage color in 640 postinfantile specimens varies

---

←

8. Balambangan, Pulau.
9. Banggi, Pulau, south, and Karakit; Maliangin Besar, Pulau.
10. Sabor, Pulau Banggi.
11. Malawali, Pulau.
12. Sabatik, Pulau.
13. Ulu Segama Reserve.
14. Bukit Garam.
15. Lokan, Sungai.
16. Betotan; Lungmanis Station.
17. Labuk Road; Sandakan, 8 mi (= 13 km) W; Sibuga Besar, Sungai.
18. Sapagaya Forest Reserve.
19. Abai; Kinabatangan, Sungai; Trusan Kinabatangan.
20. Dewhurst Bay; Kretam Besar, Sungai; Kretam Kechil, Sungai.
21. Lahad Datu; Segama, Sungai.
22. Darvel Bay.
23. Tawau Hills National Park.
24. Tawau.

Sarawak (Sar)

1. Samunsam Wildlife Sanctuary.
2. Penrissen, Gunung.
3. Paku Cave.
4. Bako National Park; Kuching; Kuching, 10th mile; Sarawak, Sungai, mouth.
5. Bukar, Sungai; Entawa, Tanjong.
6. Pelandok, Sungai.
7. Simunjan, Sungai.
8. Lingga.
9. Paku, Saribas.
10. Jumpit.
11. Lanjak-Entimau Orang-Utan Sanctuary (proposed).
12. Belaga.
13. Dulit, Bukit.
14. Selikan, Bukit.
15. Similajau National Park.
16. Niah Caves.
17. Niah National Park.
18. Baram, Batang; Baram district; Miri; Miri, Sungai; Miri district.
19. Long Ekang.
20. Kalulong, Bukit.
21. Gunong Mulu National Park; Melinau Gorge; Mulu, Gunung.
22. Punang, Sungai.

Absence reports

a. Manuk Manka Island, Philippines (see Fooden, 1991, p. 40).
b. Masalembu Besar, Pulau.
c. Sangeang, Pulau.
d. Banta, Pulau; Bugis, Gili; Lawadarat, Gili; Lawalaut, Gili; Longos, Nusa; Misa, Pulau; Papagaranbesar, Pulau; Sababi, Pulau; Sabajor Besar, Pulau; Sebolon Besar, Pulau; Siaba Besar, Pulau; Tatawa, Pulau.
e. Kelapa, Pulau; Komodo, Pulau; Langkoi, Pulau; Lengah, Pulau; Mbarapu, Nusa; Motang, Gili; Padar, Pulau; Padar-kecil, Pulau.
f. Lomblen, Pulau.
g. Pantar, Pulau.
h. Alor, Pulau.

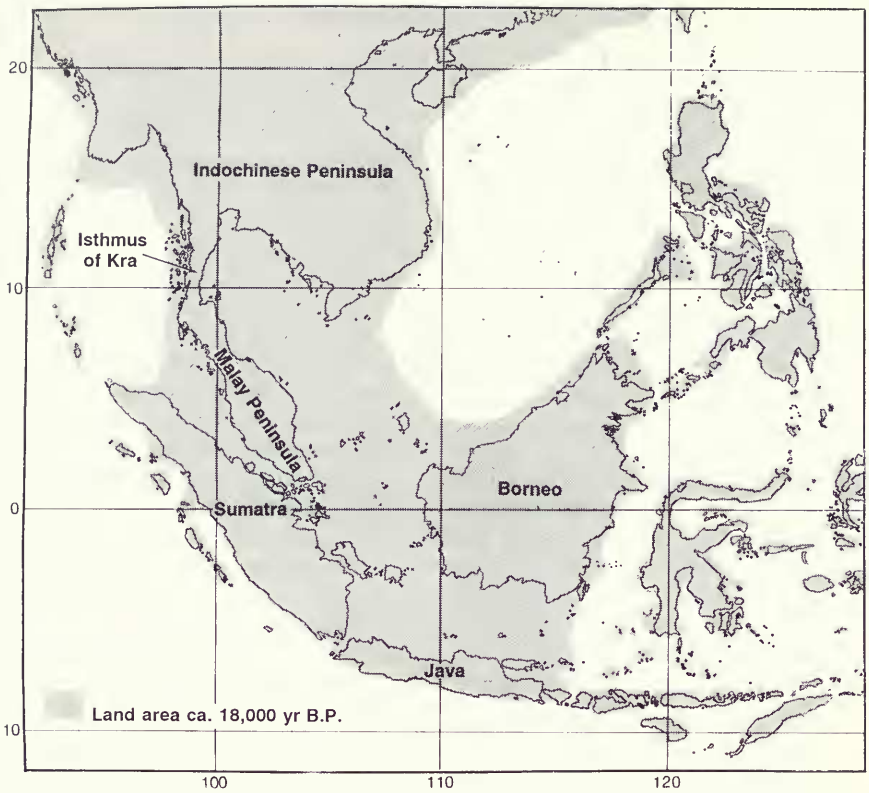

FIG. 3. Approximate extent of dry land in Southeast Asia during last glacial maximum, ca. 18 Ka; estimate based on present-day 120-m bathymetric line (Heaney, 1986, p. 137; 1991b, p. 147; U.S. Defense Mapping Agency bathymetric charts Nos. 63020, 1993; 63400, 1990; 71000, 1975a; 71006, 1975b; 93036, 1985; 94004, 1986).

from buffy (SI = 0.5) to dark brown (SI = 3.0) (Tables 1, 2); relatively few of these specimens (4.5%) are darker than medium brown (SI = 2.0). Pelage color in core-area specimens averages palest in the Indochinese Peninsula (mean SI = 0.99, n = 93), becomes darker southward and reaches maximum saturation in Sumatra (mean SI = 1.38, n = 178) and Borneo (mean SI = 1.47, n = 239), and then becomes somewhat paler farther southward in Java (mean SI = 1.26, n = 77). Within the Indochinese Peninsula, pale specimens are particularly concentrated near the northwestern margin of the species range, north of 14°N between 98°E and 102°E (mean SI = 0.73, n = 42). In all parts of the core area, variation in dorsal pelage saturation is relatively great, and overlap in saturation between samples from different parts of the core area is extensive. For example, a pale golden brown adult male collected in western Thailand (FMNH 99642, Ban Tamrong Phato) almost perfectly matches an adult male collected in southern Sumatra (AMNH 102765, Muaradua), and a pale yellowish brown adult male collected in east-central Sumatra (USNM 113169, Indragiri, Sungai) matches an adult male collected in western Java (USNM 156291, Bantargebang).

Fringing-island specimens examined include 491 postinfantile skins—234 collected in 71 shallow-water islands and 257 collected in 27 deep-water islands (Appendix 3). Although dorsal pelage saturation in most fringing-island specimens broadly overlaps that in core-area specimens, mean SI in fringing-island samples tends to exceed that in neighboring core-area samples (53 of 71 shallow-water fringing-island samples, 23 of 27 deep-water fringing-island samples).

Strikingly dark fringing-island samples (conspicuously darker than any other *M. fascicularis* samples examined) have been collected in six deep-water islands that constitute three geographic units: (1) Nicobar Islands (Katchall, Little Nicobar, Great Nicobar), northwest of Sumatra (mean SI = 3.9, n = 8); (2) P. Simeulue and P. Lasia, west of Sumatra (mean SI = 4.0, n = 15); and (3) P. Maratua,

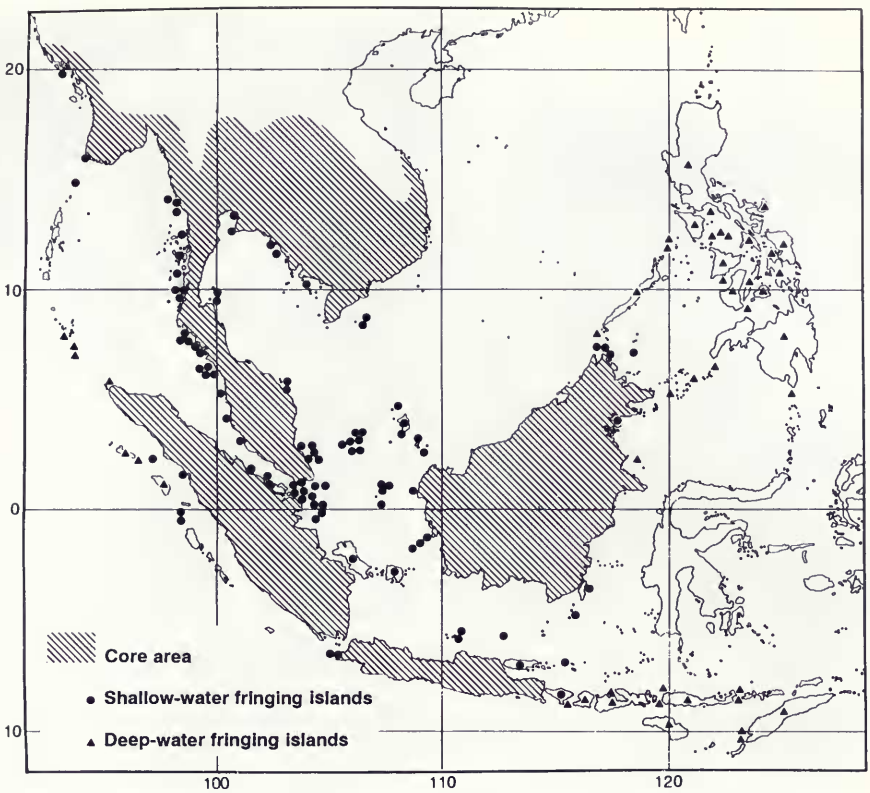

FIG. 4. Core area, shallow-water (< 120 m) fringing islands, and deep-water (≥ 120 m) fringing islands inhabited by *Macaca fascicularis* (cf. Fig. 3). For names of islands, see Figure 2 and Fooden (1991, p. 2).

east of Borneo (mean SI = 4.0, n = 4). The peripheral and disjunct distribution of these intensely saturate populations of *M. fascicularis* was noted previously by Kellogg (1944, p. 76). Dorsal pelage also is relatively dark in many islands of the Philippine Archipelago (deep-water); in western, northern, and eastern Philippine islands, mean SI varies from 2.4 to 3.0 (cf. Fooden, 1991, p. 5). A brief, equivocal comment alluding to pelage saturation in *M. fascicularis* in deep-water P. We, north of Sumatra, has been published by Scheffrahn et al. (1994, p. 136).

The darkest shallow-water fringing-island sample was collected in P. Karimunjawa, north of Java (mean SI = 2.7, n = 6; cf. Sody, 1949, p. 132). A shallow-water fringing-island sample from Ko Khram Yai, in the Inner Gulf of Thailand, also is conspicuously darker (mean SI = 1.8, n = 10) than neighboring core-area specimens (cf. Kloss, 1919c, p. 347). Inconclusively small shallow-water island samples of dark specimens have been collected in P. Redang, east of the Malay Peninsula (mean SI = 2.5, n = 2), Ko Na Ka Yai, west of peninsular Thailand (SI = 2.5, n = 1), and P. Belitung, between Sumatra and Borneo (mean SI = 2.3, n = 2).

DORSAL PELAGE ERYTHRISM—Dorsal pelage erythrism in *M. fascicularis* has been investigated by comparing specimens examined with selected standard specimens, in a procedure parallel to that used in investigating saturation (see above). The range of standard erythrism index (EI) values extends from 1.0 to 3.0, as follows: EI = 1.0, nonerythristic, color of pale hair bands pale yellowish (FMNH 99651, Thailand: Kata Taek); EI = 2.0, moderately erythristic, pale hair bands golden (FMNH 33505, Vietnam: Ho Chi Minh City); and EI = 3.0, intensely erythristic, pale hair bands rufescent (FMNH 62913, Philippines: Palawan, Puerto Princesa). Specimens marginal in erythrism between primary standards have been assigned EI values of 1.5 or 2.5. Infant skins are excluded from the analysis.

In core-area samples, erythrism in *M. fascicularis* averages relatively high in Sumatra and in the adjacent Malay Peninsula, south of 10°N (Ta-

FIG. 5. External characters in *Macaca fascicularis*—left, Thailand: Lop Buri, Sarn Pra Karn, adult male; right, Indonesia: P. Bali, Sangeh, adult female and adult male.

bles 3, 4). Of 645 postinfantile core-area skins examined, 24 are intensely erythristic (EI = 3.0); all of these intensely erythristic specimens originated either in Sumatra or in the adjacent Malay Peninsula. Within Sumatra and the Malay Peninsula, intense erythrism apparently is an individual variable, not a local variable; in local samples ($n > 1$) that include intensely erythristic specimens, the frequency of such specimens varies from 0.12 (Sumatra: Batangkuis; $n = 8$) to 0.50 (West Malaysia: Port Dickson; $n = 4$). Intense erythrism (EI = 3.0) occurs in relatively pale core-area specimens (ZRC 4-075, West Malaysia: Port Dickson, SI = 1.0) as well as in darker specimens (ZSBS C-176, Sumatra: Kampong Baru, SI = 2.5). The high incidence of intense erythrism in *M. fascicularis* in the Malay Peninsula has been indicated previously by Kloss (1919c, p. 347) and Chasen (1940a, p. 67). Aggimarangsee (1992, p. 119) reported on erythrism in a provisioned population of *M. fascicularis* at Kosumphi Forest Park, northeastern Thailand.

In fringing-island samples, erythrism data are available for 234 postinfantile specimens collected in 71 shallow-water islands and 218 postinfantile specimens collected in 25 deep-water islands (Appendix 4). In shallow-water fringing-island samples, mean EI tends to exceed that in neighboring core-area samples (mean EI greater in 48 fringing-island samples, mean EI less in 16 fringing-island samples, mean EI equal in 7 fringing-island and core-area samples). Geographic variation of erythrism in shallow-water fringing-island samples generally parallels that in neighboring core-area samples: 13 intensely erythristic specimens (EI = 3.0) have been collected in 10 shallow-water fringing islands (Bintan, Bulan, Durian, Karimun, and Nguwal, in the Riau Archipelago, east of Sumatra; Redang, Siantan, and Tioman, east of the Malay Peninsula; Pinang [1] and Pintu Gedong, west of the Malay Peninsula; and Singapore); all 10 shallow-water fringing islands from which intensely erythristic *M. fascicularis* specimens have been collected are adjacent to Sumatra or the Malay Peninsula, where intensely erythristic core-area specimens have been collected. In these 10 fringing islands, the frequency of intensely erythristic specimens varies from 0.09 (Tioman, $n = 11$) to 1.00 (Redang, $n = 2$).

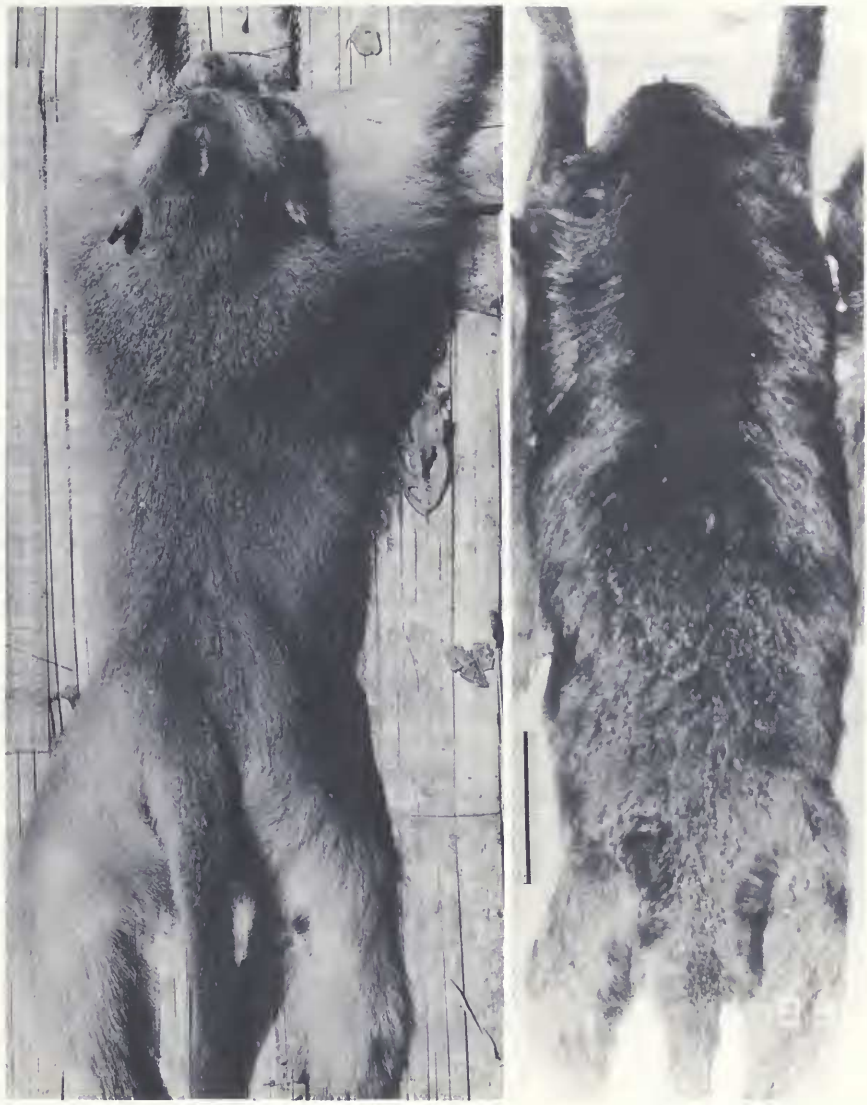

FIG. 6. Dorsal pelage color saturation extremes in *Macaca fascicularis*—FMNH 99651 (left), adult male, Thailand: Kata Taek, buffy (saturation index value, 0.5); USNM 114168 (right), adult male, Indonesia: P. Simeulue, Lugu Sibaboh, blackish (SI value, 4.0). Scale bar 10 cm.

In deep-water fringing islands, erythrism is relatively high in most islands of the Philippine Archipelago (Appendix 4) and is particularly high in Palawan, as noted previously (Fooden, 1991, p. 8). Erythrism is low in the very dark insular populations west of Sumatra (Appendix 4), and erythrism also is generally low in the deep-water Lesser Sunda Islands, as in nearby Java (Tables 3, 4).

CROWN COLOR—As previously indicated, the crown in *M. fascicularis* usually is more brightly colored than the back; however, in 63 of 1,103 postinfantile specimens examined (Table 5), the crown is darker than the back (Fig. 7) as a result of reduction or absence of pale bands in crown hairs. Darkness of the crown in these specimens varies from a dilute blackish wash to an irregular blackish streak to a clearly defined blackish patch. In dark-crowned specimens, the periphery of the crown patch usually is darker than the center.

Of 648 core-area postinfantile specimens examined, dark crowns are clearly defined in 1 and weakly defined in 13 (Table 5, Appendix 5). Thirteen of these 14 dark-crowned specimens, including the one with a clearly defined dark crown, were

TABLE 1. Dorsal pelage color saturation in core-area samples of *Macaca fascicularis*[1]: summary of variation (cf. Table 2).

Sample area	N	Frequencies (%) at SI values						Mean SI value
		0.5	1.0	1.5	2.0	2.5	3.0	
Indochinese Peninsula[2]	93	41.9	29.0	18.3	10.8			0.99
Malay Peninsula[3]	53	11.3	34.0	45.3	9.4			1.26
Sumatra	178	4.5	23.6	67.4	1.7	1.7	1.1	1.38
Borneo	239	0.8	43.9	24.3	21.8	9.2		1.47
Java	77	10.4	41.5	35.1	10.4	2.6		1.26
ALL	640	9.8	35.0	38.5	12.2	4.2	0.3	1.33

[1] Excludes infants.
[2] Includes Isthmus of Kra north of 10°N.
[3] Includes Isthmus of Kra south of 10°N.

collected in the Indochinese Peninsula or adjoining Isthmus of Kra north of 10°N (n = 94); one, with a weakly defined dark crown, was collected in Borneo (n = 242). The Indochinese specimen with a clearly defined dark crown (BM(NH) 1881.6.30.2, adult male) was collected in southern Vietnam ("Cochin China"; cf. Elliot, 1909, p. 252; Kloss, 1926, p. 358).

In fringing-island samples, most dark-crowned specimens also were collected in the vicinity of the Indochinese Peninsula and northern part of the Isthmus of Kra (Table 5, Appendix 5). Of 452

TABLE 2. Dorsal pelage color saturation in core-area *Macaca fascicularis* (n = 506)[1]: geographic variation of mean value in 2-degree latitude–longitude blocks (sample size indicated by italicized figures in parentheses) (cf. Table 1).

Latitude	Longitude (°E)											
	96–98	98–100	100–102	102–104	104–106	106–108	108–110	110–112	112–114	114–116	116–118	118–120
16–18 (°N)	1.0 (*1*)	0.6 (*14*)			1.0 (*1*)		1.5 (*1*)					
14–16		0.8 (*21*)	0.8 (*7*)			1.0 (*1*)						
12–14		1.1 (*22*)	1.0 (*2*)	1.0 (*3*)	0.5 (*1*)		1.0 (*1*)					
10–12		1.6 (*6*)				1.5 (*12*)						
8–10		0.8 (*8*)	1.0 (*1*)									
6–8		1.1 (*6*)	1.0 (*3*)								1.3 (*20*)	
4–6	1.0 (*1*)		1.5 (*6*)						1.0 (*1*)	1.6 (*8*)	1.4 (*16*)	1.2 (*29*)
2–4	1.5 (*1*)	1.4 (*66*)	1.4 (*16*)	1.4 (*11*)						1.6 (*12*)	1.6 (*8*)	1.5 (*2*)
0–2		1.3 (*2*)	3.0 (*1*)					1.5 (*32*)	1.8 (*6*)	1.5 (*1*)	1.7 (*3*)	
0–2 (°S)			1.4 (*16*)	1.0 (*1*)			1.5 (*1*)	1.2 (*5*)		2.1 (*4*)	1.7 (*3*)	
2–4			1.0 (*1*)	1.2 (*9*)	1.8 (*2*)				1.4 (*26*)	1.4 (*4*)		
4–6					1.1 (*17*)							
6–8					0.5 (*1*)	1.1 (*23*)	1.3 (*32*)	1.3 (*4*)	1.0 (*1*)			
8–10									1.0 (*3*)			

[1] Excludes 134 imprecisely localized specimens that are included in Table 1.

TABLE 3. Dorsal pelage erythrism in core-area *Macaca fascicularis*[1]: summary of variation (cf. Table 4).

Sample area	N	Frequencies (%) at EI values					Mean EI value
		1.0	1.5	2.0	2.5	3.0	
Indochinese Peninsula[2]	93	69.9	5.4	23.6	1.1		1.28
Malay Peninsula[3]	53	37.7	17.0	30.2	5.7	9.4	1.66
Sumatra	180	23.3	8.3	56.7	1.1	10.6	1.84
Borneo	241	46.9	34.4	18.3	0.4		1.36
Java	78	57.7	23.1	19.2			1.31
ALL	645	44.2	20.2	30.8	1.1	3.7	1.50

[1] Excludes infants.
[2] Includes Isthmus of Kra north of 10°N.
[3] Includes Isthmus of Kra south of 10°N.

fringing-island postinfantile specimens examined, dark crowns are clearly defined in 17 and weakly defined in 32. Thirty-seven of the 49 dark-crowned specimens were collected in shallow-water islands adjacent to the Indochinese Peninsula or Isthmus of Kra. Of the 17 specimens with clearly defined dark crowns, 16 originated in three islands adjacent to the Indochinese Peninsula: Ko Khram Yai, in the Inner Gulf of Thailand (n = 10: dark crown clearly defined, 7; weakly defined, 3); Con Son, in the South China Sea (n = 9: clearly defined, 8; weakly defined, 1); and Hon Ba, an islet adjacent to Con Son (n = 3: clearly defined, 1; weakly defined, 2) (cf. Kloss, 1916b, p. 32; 1919c, p. 347;

TABLE 4. Dorsal pelage erythrism in core-area *Macaca fascicularis* (n = 510)[1]: geographic variation of mean value in 2-degree latitude–longitude blocks (sample size indicated by italicized figures in parentheses) (cf. Table 3).

Latitude	Longitude (°E)											
	96–98	98–100	100–102	102–104	104–106	106–108	108–110	110–112	112–114	114–116	116–118	118–120
16–18 (°N)	1.0 (*1*)	1.4 (*14*)			2.0 (*1*)		2.0 (*1*)					
14–16		1.3 (*21*)	1.1 (*7*)			2.0 (*1*)						
12–14		1.1 (*22*)	1.0 (*2*)	1.3 (*3*)	1.0 (*1*)		1.0 (*1*)					
10–12		1.4 (*6*)				1.5 (*12*)						
8–10		1.3 (*8*)	1.5 (*1*)									
6–8		1.4 (*6*)	2.0 (*3*)								1.1 (*20*)	
4–6	2.0 (*1*)		1.6 (*6*)						2.0 (*1*)	1.4 (*8*)	1.4 (*16*)	1.1 (*29*)
2–4	2.0 (*1*)	1.8 (*68*)	2.1 (*16*)	1.6 (*11*)						1.5 (*12*)	1.4 (*8*)	1.3 (*2*)
0–2		1.8 (*2*)	2.0 (*1*)					1.5 (*32*)	1.1 (*6*)	1.0 (*1*)	1.2 (*3*)	
0–2 (°S)			2.1 (*16*)	1.3 (*1*)			2.0 (*1*)	1.4 (*5*)		1.4 (*4*)	2.0 (*3*)	
2–4			1.5 (*1*)	1.6 (*9*)	2.5 (*2*)				1.5 (*26*)	1.4 (*5*)		
4–6					1.5 (*17*)							
6–8					1.0 (*1*)	1.2 (*24*)	1.2 (*32*)	1.1 (*4*)	1.5 (*1*)			
8–10									1.0 (*3*)			

[1] Excludes 135 imprecisely localized specimens that are included in Table 3.

TABLE 5. Crown color pattern in *Macaca fascicularis*[1]: summary of variation. For details, see Appendix 5.

		Frequencies of crown color patterns					
		Crown colored like back, or brighter		Crown with diffuse blackish streak or wash		Crown with clearly defined blackish patch[2]	
Sample area	N	N	%	N	%	N	%
Core area	648	634	97.8	13	2.0	1	0.2
Indochinese Peninsula[3]	94	81	86.1	12	12.8	1	1.1
Malay Peninsula[4]	53	53	100.0				
Sumatra	179	179	100.0				
Borneo	242	241	99.6	1	0.4		
Java	80	80	100.0				
Shallow-water fringing islands	234	190	81.2	28	12.0	16	6.8
Deep-water fringing islands	221	216	97.7	4	1.8	1	0.5
TOTALS	1,103	1,040	94.3	45	4.1	18	1.6

[1] Excludes infants.
[2] Cf. Figure 7.
[3] Includes Isthmus of Kra north of 10°N.
[4] Includes Isthmus of Kra south of 10°N.

1921, p. 76; 1926, p. 358). In Ko Khram Yai specimens, the crown patch is distinctively narrow (Fig. 7) and is notably darker peripherally than centrally (see below, *M. f. atriceps*). The only non-Indochinese fringing-island specimen with a clearly defined dark crown is one of two specimens (USNM 144666) collected in Basilan I., a deep-water island in the south-central Philippines. Although the crown is blackish in *M. fascicularis* specimens collected in P. Simeulue and P. Lasia, deep-water islands west of Sumatra, the color of the crown in these specimens does not contrast with the color of the back, which also is blackish.

LATERAL FACIAL CREST PATTERN (Fig. 8)—The

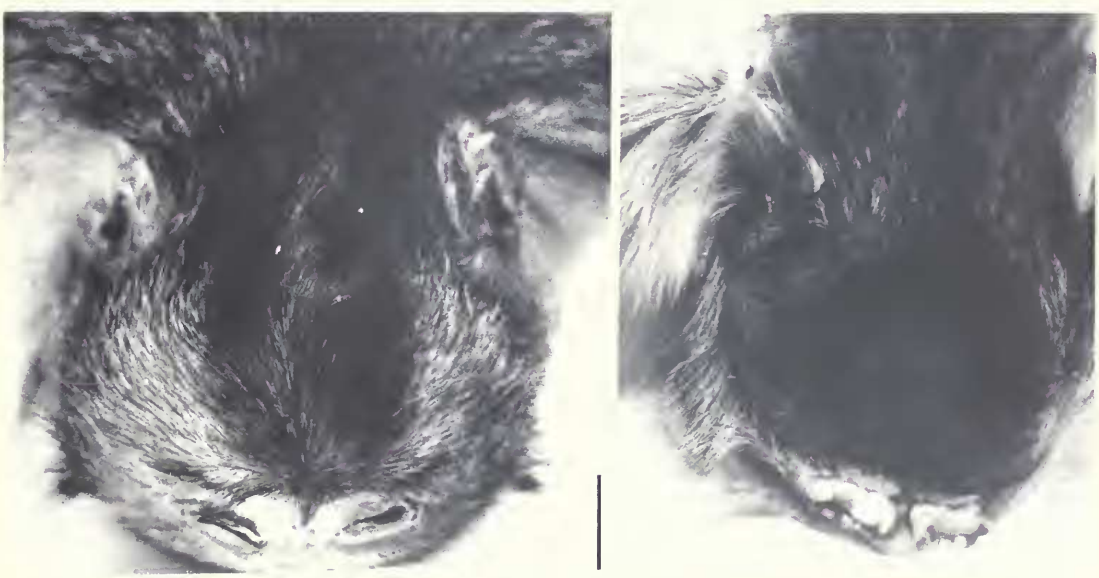

FIG. 7. Crown color pattern in dark-crowned *Macaca fascicularis*—USNM 236618 (left), adult male, Thailand: Ko Khram Yai, *M. f. atriceps*; USNM 357241 (right), adult male, Vietnam: Hon Ba, 3.1 km W and 0.6 km S of Ben Dam, *M. f. condorensis*. Scale bar 2 cm.

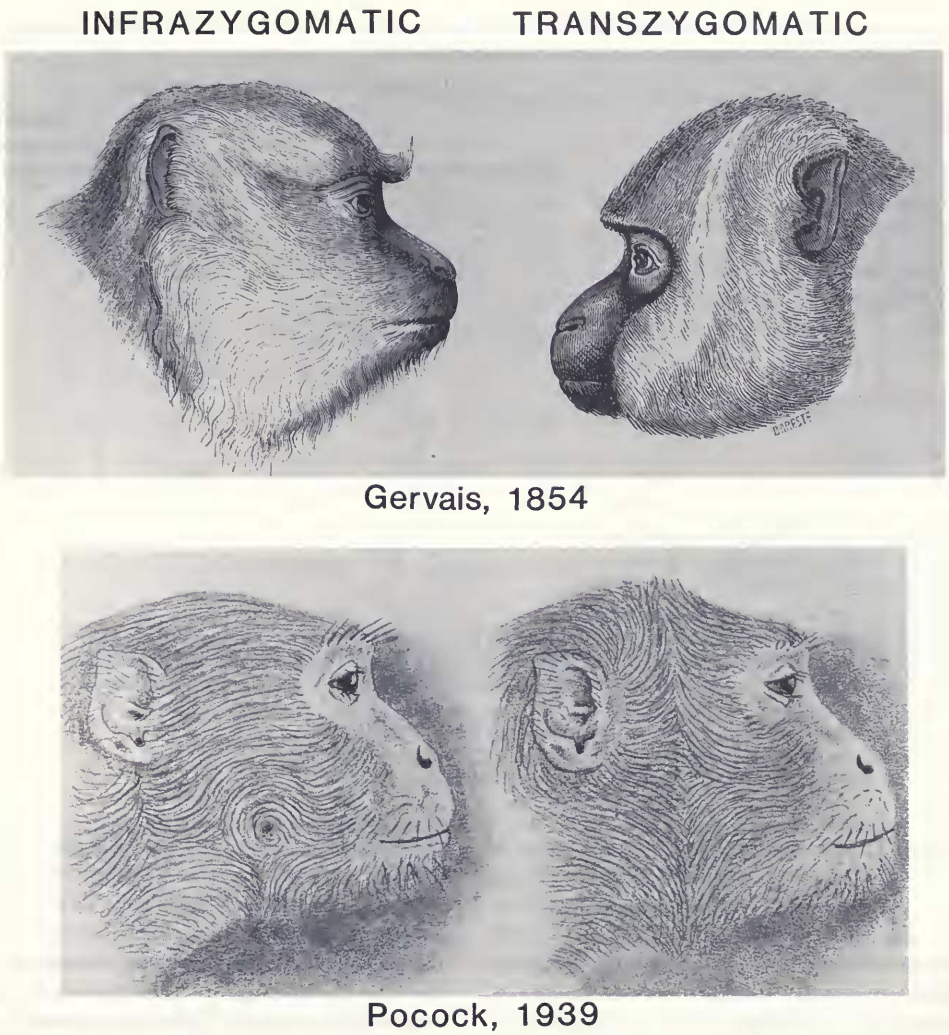

FIG. 8. Infrazygomatic and transzygomatic lateral facial crest patterns in *Macaca fascicularis,* as depicted by Gervais (1854, p. 87) and Pocock (1939, Pl. V). In both depictions, note posteriorly directed preauricular hairs in the infrazygomatic pattern and anteriorly directed preauricular hairs in the transzygomatic pattern.

pale lateral facial crest in *M. fascicularis* is formed by the convergence of variably elongated posteriorly directed hairs of the anterolateral facial region and anteriorly directed hairs of the posterolateral facial region. In most specimens examined, this crest sweeps upward from near the angle of the jaw to the lateral margin of the crown, passing between the eye and ear (transzygomatic crest pattern); less commonly, the crest is restricted to the mandibular region and terminates superiorly in a whorl low on the cheek (infrazygomatic crest pattern) (cf. Pocock, 1939, p. 78). In the infrazygomatic pattern, unlike the transzygomatic pattern, hairs of the temporal region are smoothly directed posteriorly from the posterior margin of the eye to the anterior margin of the ear (anteriorly directed hairs are absent in this region); as a result, the infrazygomatic crest lacks the upper (preauricular) portion of the transzygomatic crest. Although the infrazygomatic pattern is relatively rare in *M. fascicularis,* it is common in *M. mulatta,* where the transzygomatic pattern occurs infrequently (Stewart, 1933, p. 30). Transzygomatic and infrazygomatic patterns can be distinguished in the hair tracts of infants as well as in postinfants.

In 819 specimens examined, the lateral facial crest pattern is transzygomatic in 728, infrazygomatic in 83, and asymmetric (transzygomatic on

TABLE 6. Lateral facial crest pattern in *Macaca fascicularis*[1]: summary of variation. For details, see Appendix 6.

		Frequencies of lateral facial crest patterns					
		Infrazygomatic		Transzygomatic		Asymmetric: infrazygomatic/ transzygomatic	
Sample area	N	N	%	N	%	N	%
Core area	396	59	14.9	332	83.8	5	1.3
Indochinese Peninsula[2]	98	57	58.1	37	37.8	4	4.1
Malay Peninsula[3]	48	1	2.1	47	97.9		
Sumatra	50			49	98.0	1[4]	2.0
Borneo	163	1[5]	0.6	162	99.4		
Java	37			37	100.0		
Shallow-water fringing islands	218	11[6]	5.0	204	93.6	3[7]	1.4
Deep-water fringing islands	205	13[8]	6.3	192	93.7		
TOTALS	819	83	10.1	728	88.9	8	1.0

[1] See Figure 8; tabulation includes infants.
[2] Includes Isthmus of Kra north of 10°N.
[3] Includes Isthmus of Kra south of 10°N.
[4] Collected at Kotabumi (sample size = 1).
[5] Collected at Mt. Tibang, Kalimantan (sample size = 1).
[6] Includes 10 specimens collected in islands west of the Indochinese Peninsula and Isthmus of Kra (see Appendix 6) and one geographically anomalous specimen collected in Indonesia: P. Bintan (sample size = 8), southeast of Singapore.
[7] Collected in islands west of the Isthmus of Kra and Malay Peninsula (see Appendix 6).
[8] Collected in the Nicobar Islands, P. Simeulue, and P. Lasia (see Appendix 6).

one side and infrazygomatic on the other) in 8 (Table 6, Appendix 6). Of the 83 specimens with the infrazygomatic pattern, 51 originated in a restricted area bordering the Bay of Bengal, at the northwestern margin of the species range (Fig. 9). No specimens with the transzygomatic pattern have been collected in this area, which includes southernmost Bangladesh, southern Burma, nearby shallow-water islands in the Mergui Archipelago, and a small part of west-central Thailand. The eastern boundary of the restricted area that is homogeneous for the infrazygomatic pattern generally coincides with the mountain ranges that form the border between Burma and Thailand.

Of the remaining 32 specimens with the infrazygomatic pattern, 17 originated in two areas adjacent to the restricted area homogeneous for the infrazygomatic pattern (Fig. 9); both of these adjacent areas are heterogeneous for the lateral facial crest pattern. Nine of these specimens originated at five scattered localities in the central and eastern parts of the Indochinese Peninsula, immediately east of the area homogeneous for the infrazygomatic pattern, along the northern margin of the range of *M. fascicularis*; seven specimens with the transzygomatic pattern also have been collected in this area (central and eastern Indochinese Peninsula), which includes two localities where specimens with both crest patterns have been collected together. Eight specimens with the infrazygomatic pattern originated at three localities in the eastern and southern parts of the Isthmus of Kra, immediately southeast of the area homogeneous for the infrazygomatic pattern; 11 specimens with the transzygomatic pattern also have been collected in this area (eastern and southern Isthmus of Kra, two adjacent west-coast islands).

The remaining 15 specimens with the infrazygomatic pattern originated at localities distant from the restricted area homogeneous for the infrazygomatic pattern. Three of these specimens originated in the Nicobar Islands, northwest of Sumatra, together with five specimens with the transzygomatic pattern. Ten specimens originated in P. Simeulue and P. Lasia, west of Sumatra, together with five specimens with the transzygomatic pattern. One specimen originated in P. Bintan, southeast of Singapore, together with seven specimens with the transzygomatic pattern. The final specimen with the infrazygomatic pattern originated in north-central Borneo, at Mt. Tibang, Kalimantan.

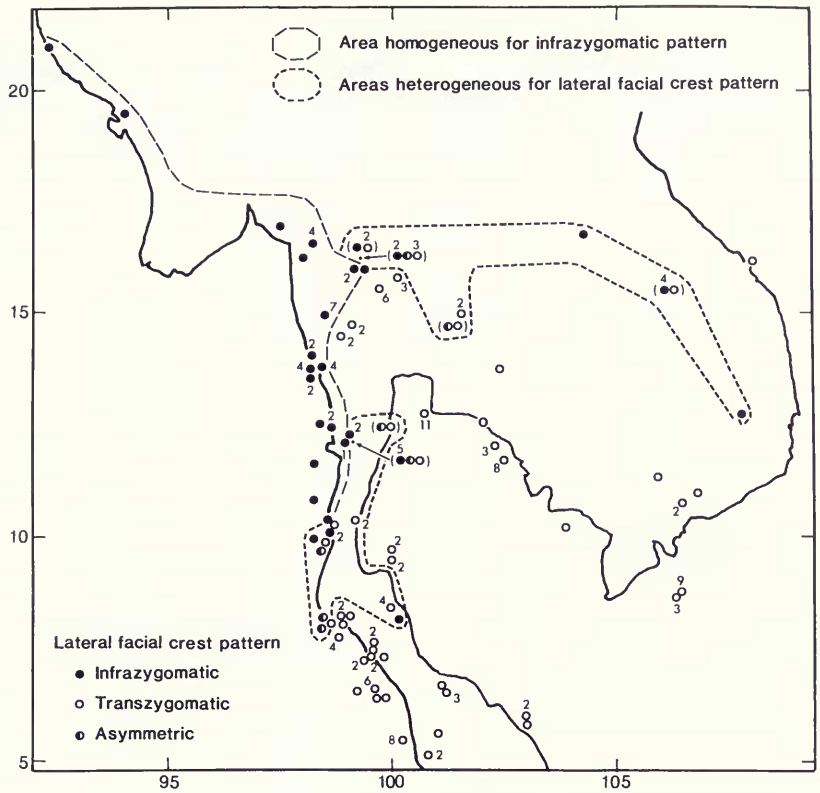

FIG. 9. Geographic variation of lateral facial crest pattern in samples of *Macaca fascicularis* collected in the Indochinese Peninsula, Isthmus of Kra, Malay Peninsula, and neighboring islands (see Appendix 6). Numerals indicate number of individuals represented by symbols, where this number exceeds 1; heterogeneous samples collected at single localities are indicated by parentheses.

Of the eight specimens with the asymmetric lateral facial crest pattern, seven originated in the two areas heterogeneous for the lateral facial crest pattern that are adjacent to the restricted area homogeneous for the infrazygomatic pattern (Fig. 9). Two of these specimens originated in the central part of the Indochinese Peninsula and five originated in the eastern part of the Isthmus of Kra or in islands adjacent to the southern part of the west coast of the Isthmus of Kra. The remaining specimen with the asymmetric lateral facial crest pattern originated, somewhat incongruously, in southeastern Sumatra, at Kotabumi.

External Measurements and Proportions

Sex and Age Variation

Collectors' measurements of wild-collected specimens of *M. fascicularis* indicate that head and body length (HB) in adult males (mean = 465.6 mm, n = 238) averages approximately 13% more than in adult females (mean = 412.0 mm, n = 161) (Table 7). Weight in adult males (mean = 5.36 kg, n = 69) averages 49% more than in adult females (mean = 3.59 kg, n = 46). Relative length of appendages is similar in adult males and females: mean relative tail length (T/HB × 100) is 117.0 (extremes 66.7–149.5) in 392 adults, mean relative hind foot length (HF/HB × 100) is 28.7 (extremes 23.2–37.8) in 365 adults, and mean relative ear length (E/HB × 100) is 8.0 (extremes 4.8–11.1) in 301 adults. (Note: Karrer [1970, p. 171] reported that the tail is semiprehensile in captive *M. fascicularis*.)

Relative length of the tail and of the hind foot in infants and juveniles exceed that in fetuses, subadults, and adults (Table 7); similarly, relative length of the ear in infants and juveniles exceeds that in subadults and adults (unknown in fetuses). This implies that, during prenatal and early postnatal life, the growth rate of the tail, hind foot,

TABLE 7. External measurements and proportions in age/sex classes of wild-collected *Macaca fascicularis*.[1]

Age/sex class[2]	Head and body length (mm)	Relative tail length[3] (T/HB × 100)	Relative hind foot length[3] (HF/HB × 100)	Relative ear length (E/HB × 100)	Weight[3] (kg)
Fetuses	82.5 54–111 (*2*)	78.8 64.8–92.8 (*2*)	23.7 19.4–27.9 (*2*)	—	—
Infants	254.8 ± 54.00 153–380 (*52*)	125.8 ± 24.52 61.8–167.3 (*50*)	33.6 ± 5.89 15.3–43.7 (*51*)	11.9 ± 2.51 7.6–18.3 (*42*)	0.76 ± 0.342[4] 0.24–1.36 (*13*)
Juveniles	361.3 ± 51.90 240-490 (*208*)	125.7 ± 15.83 60.3–167.8 (*205*)	32.0 ± 2.95 23.6–40.0 (*197*)	8.9 ± 1.74 5.1–14.1 (*183*)	2.36 ± 0.917 0.90–4.54 (*75*)
Subadults	—	120.4 ± 17.66 59.7–164.1 (*106*)	29.7 ± 2.24 24.7–35.7 (*97*)	7.9 ± 1.20 4.8–11.1 (*81*)	—
Subadult females	397.6 ± 32.33 326–475 (*39*)	120.9 ± 17.63 59.7–159.7 (*39*)	29.8 ± 1.88 26.5–33.5 (*36*)	7.6 ± 1.40 4.9–9.6 (*29*)	3.41 ± 0.731 2.50–4.88 (*14*)
Subadult males	453.8 ± 44.36 356–600 (*67*)	120.1 ± 17.81 63.7–164.1 (*67*)	29.6 ± 2.43 24.7–35.7 (*61*)	8.0 ± 1.06 4.8–11.1 (*52*)	5.15 ± 0.967 3.86–7.26 (*23*)
Adults	—	117.0 ± 14.50 66.7–149.5 (*392*)	28.7 ± 2.42 23.2–37.8 (*365*)	8.0 ± 1.34 4.8–11.1 (*301*)	—
Adult females	412.0 ± 36.86 315–545 (*161*)	116.4 ± 15.55[5] 70.4–148.4 (*159*)	28.8 ± 2.43 23.5–36.2 (*153*)	7.8 ± 1.28 5.0–10.5 (*131*)	3.59 ± 0.690[6,7] 2.35–5.44 (*46*)
Adult males	465.6 ± 42.48 370–630 (*238*)	117.6 ± 13.37[8] 69.2–149.5 (*232*)	28.7 ± 2.42 23.2–37.8 (*212*)	8.1 ± 1.37 4.8–11.1 (*170*)	5.36 ± 1.438[6,7] 3.40–12.00 (*69*)

[1] Mean ± SD (where n > 2), extremes, and sample size (italicized figures in parentheses).

[2] Dental specifications: infants, deciduous teeth only; juveniles, some permanent teeth erupted; subadults, M3 in females or C in males incompletely erupted (cf. Spiegel, 1952, p. 129); adults, all permanent teeth completely erupted.

[3] Cf. Spiegel (1985, pp. 27, 37, 53), who recorded postnatal growth of tail length, hind foot length, and body weight in captive *M. fascicularis*; cf. Shimizu et al. (1994, p. 175), who reported on effect of dietary restriction on growth in captive *M. fascicularis*.

[4] In captivity, mean birth weight is 0.34 kg for females (n = 156) and 0.37 kg for males (n = 166) (Dang et al., [1993], p. 150; cf. Berkson, 1968, p. 352).

[5] Excludes bobtailed specimen ZRC 4-127, West Malaysia: P. Tioman, Telok Juara (HB = 409, T = 215, T/HB × 100 = 52.6).

[6] Cf. J. Suzuki and Varavudhi (1989, p. 111) and Varavudhi et al. (1989a, p. 225), who have reported higher mean weights in artificially provisioned troops studied in Thailand (adult females, 4.03–5.86 kg; adult males, 6.80–9.33 kg; cf. Aggimarangsee, 1992, p. 139).

[7] Cf. Bakar et al. (1981, p. 12).

[8] Excludes bobtailed specimens MZB 6483, Java: Cikujang (HB = 540, T = 250, T/HB × 100 = 46.3); and BM(NH) 1955.1511, Thailand: Ko Butang (HB = 403, T = 269, T/HB × 100 = 66.7).

and ear exceeds the growth rate of the head and body and that subsequently—probably beginning in late infancy—the growth rate of the head and body exceeds that of the appendages (cf. Lumer & Schultz, 1941, p. 284; Karrer, 1970, p. 172; Yoshida et al., 1993, p. 438).

Geographic Variation

HEAD AND BODY LENGTH—In 184 core-area adults, geographic variation of HB is generally similar in females and males (Table 8, Fig. 10). Surveying this variation from south to north, HB

TABLE 8. Head and body length in core-area *Macaca fascicularis*: summary of variation (cf. Fig. 10).

Sample area	Adult females			Adult males		
	N	Mean ± SD	Extremes	N	Mean ± SD	Extremes
Indochinese Peninsula[1]	16	449.1 ± 50.26	354–545	3	531.0 ± 98.02	434–630
Malay Peninsula[2]	11	393.6 ± 21.75	360–432	14	445.5 ± 46.62	370–519
Sumatra	5	420.6 ± 27.69	380–458	20	484.9 ± 37.04	420–551
Borneo	43	408.0 ± 27.34	354–469	42	473.1 ± 43.05	400–590
Java	11	435.1 ± 33.30	350–480	19	512.7 ± 46.29	434–610
ALL	86	418.0 ± 37.22	350–545	98	481.0 ± 49.24	370–630

[1] Includes Isthmus of Kra north of 10°N.
[2] Includes Isthmus of Kra south of 10°N.

in both sexes is relatively great in Java (ca. 7°S); generally declines northward and reaches a minimum at 0°–5°N in the Malay Peninsula, Sumatra, and Borneo; increases to about 12°N in the Isthmus of Kra; and decreases farther northward to about 16°N, the latitude of the northernmost measured specimens in the Indochinese Peninsula (cf. Aimi et al., 1982, p. 53). At similar latitudes in the Malay Peninsula, Sumatra, and Borneo, HB in each sex is approximately equal. The pattern of geographic variation of HB in core-area *M. fascicularis* parallels that previously reported for skull length in core-area samples of this species (Fooden & Albrecht, 1993, p. 526); for both HB and skull length, size variation in core-area *M. fascicularis* generally follows Bergmann's rule (cf. Mayr, 1963, p. 319), except for the aberrant northward decrease of size north of 12°N in the Indochinese Peninsula. One adult female collected at 7°01'S in Java appears abnormally small (MCZ 12757, Bantargebang, HB = 350 mm); a subadult female (USNM 156292, HB = 380 mm) collected at the same locality is larger.

Fringing-island HB data are available for 215 adult specimens collected in 59 shallow-water islands and 21 deep-water islands (Appendix 7). In most of these islands, sample size is too small to determine conclusively whether or not insular HB differs from core-area HB at similar latitudes; however, mean HB in shallow-water fringing-island samples generally is less than in corresponding core-area samples (Table 9, Fig. 11). This pattern of HB variation in shallow-water fringing islands suggests a tendency toward insular dwarfism, as previously also observed for skull length variation (Fooden & Albrecht, 1993, p. 525). HB is particularly small, compared with HB in core-area reference samples, in Pinang [1] (west of the Malay Peninsula) and Bali (east of Java).

Among deep-water fringing-island samples, only those from the Lesser Sunda Islands show a clear tendency toward insular dwarfism (Table 9, Fig. 12, Appendix 7); in this respect, these samples resemble the sample from nearby Bali (see above), the shallow-water member of the Lesser Sunda group. In other deep-water fringing islands, HB in male samples tends to exceed that in core-area reference samples, and in Mindanao (Philippines) HB in both sexes conspicuously exceeds that in core-area reference samples. In one of four adult females collected in P. Simeulue (west of Sumatra; USNM 121513, HB = 325 mm), HB appears to be abnormally small; the skull and recorded body weight of this female are not particularly small (greatest skull length = 102.4 mm, weight = 3.74 kg).

TAIL LENGTH—Collectors' measurements of tail length (T) are available for 183 core-area adults and 222 fringing-island adults (Table 10, Appendix 8). Although T averages less in females than in males, relative T (T/HB × 100) is approximately equal in the two sexes, as indicated above (Table 7). Because geographic variation of T is not always concordant with geographic variation of HB, T variation and relative T variation are considered separately in the following discussion.

In core-area specimens of each sex, T tends to be negatively correlated with latitude (Fig. 13), in accord with Allen's rule (Mayr, 1963, p. 323). T averages greatest near the equator in the Malay Peninsula, Sumatra, and Borneo, somewhat less in Java (6°–8°S), and least at 15°–17°N in the Indochinese Peninsula. In the Malay Peninsula, Sumatra, and Borneo, T—like HB (see above)—is approximately equal in each sex at similar latitudes. In Java, T is highly variable. T reduction in Indochinese *M. fascicularis* has been noted previously (Fooden, 1964, p. 363; 1971, p. 29).

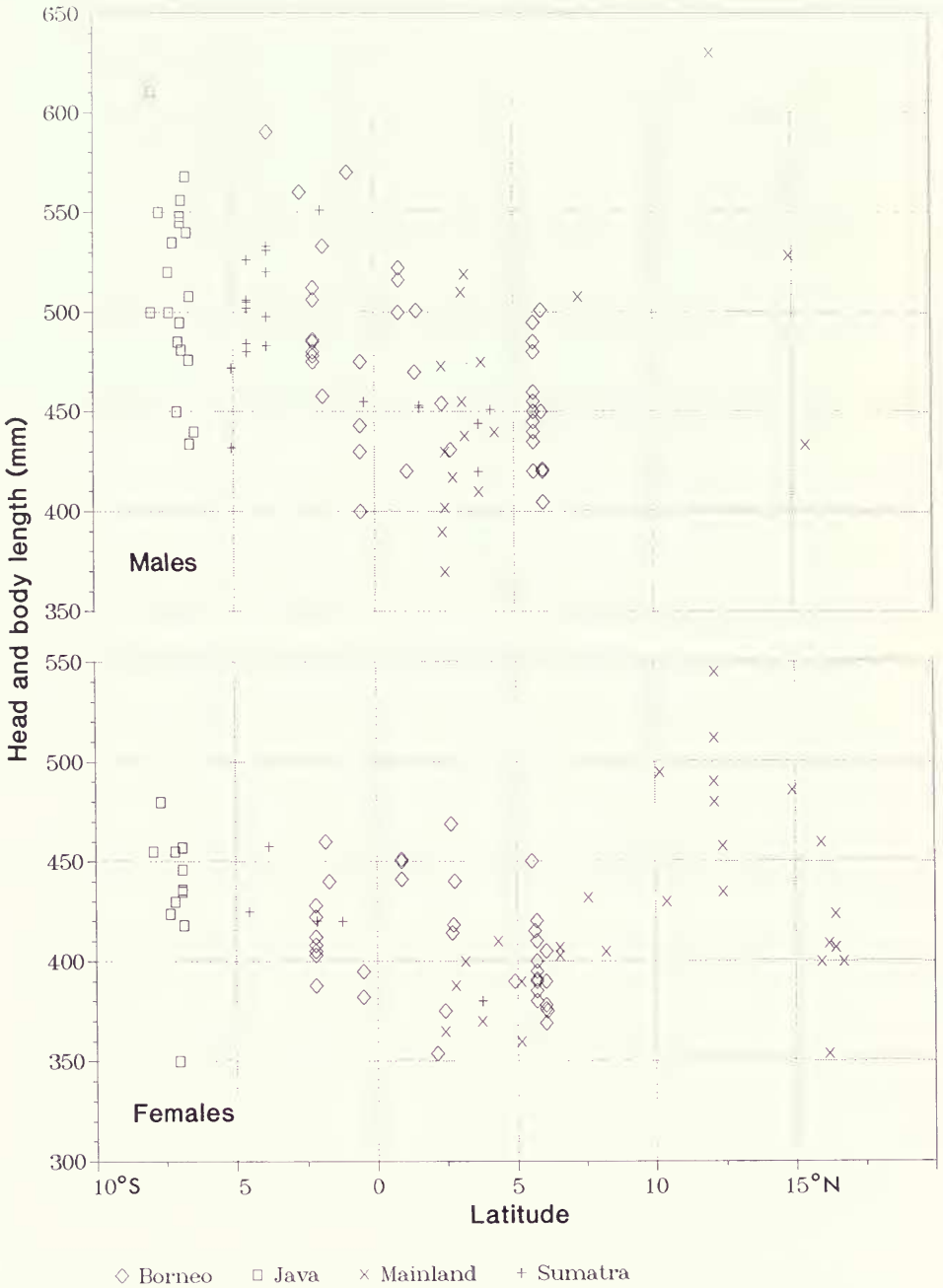

FIG. 10. Latitudinal variation of head and body length in adult core-area specimens of *Macaca fascicularis* (cf. Table 8).

Relative T in core-area specimens also is negatively correlated with latitude (Fig. 14). Since HB generally is positively correlated with latitude (Fig. 10), the negative correlation of relative T (T/HB × 100) with latitude is exaggerated relative to that of T.

Problematic T measurements have been reported by Van Peenen et al. (1971, p. 134; cf. 1969,

TABLE 9. Summary comparison of head and body length in fringing-island (FI) and core-area (CA) samples of *Macaca fascicularis*. For details, see Appendix 7.

Categories of FI samples	Shallow-water FI samples			Deep-water FI samples		
	Number of islands	FI > CA[1]	CA > FI[2]	Number of islands	FI > CA[1]	CA > FI[2]
1. FI sample includes both sexes						
a. Sexes in FI sample deviate concordantly from those in CA sample	13	3	10	5	1	4
b. Sexes in FI sample deviate discordantly from those in CA sample						
1) Females, FI > CA; males, CA > FI	1	0.5	0.5	1	0.5	0.5
2) Females, CA > FI; males, FI > CA	5	2.5	2.5	5	2.5	2.5
2. FI sample includes only one sex						
a. Females	7	2	5	2	1	1
b. Males	33	7	26	8	5	3
TOTALS	59	15	44	21	10	11

[1] FI sample mean exceeds CA sample mean.
[2] CA sample mean exceeds FI sample mean.

p. 100) for two core-area specimens identified by these authors as *M. fascicularis*; these specimens were collected in 1965 and 1967 at Sontra Peak, Vietnam (16°07′N, 108°18′E). The problematic measurements (in millimeters) are the following: adult male, total length = 730, T = 222 (HB = 508, relative T = 43.7%), and immature female, total length = 665, T = 230 (HB = 435, relative T = 52.9%). The skull of the male and the skin and skull of the female are preserved in the collection of the USNM (No. 356979, adult male; No. 356968, subadult female).

Collectors' field notes, kept in the archives of the Division of Mammals, USNM (photocopies provided by Linda Gordon and David F. Schmidt), confirm the accuracy of measurements reported by Van Peenen et al. (1971) for the male, but these notes indicate that total length of the female is 615 (HB = 385, relative T = 59.7%), not 665, as reported by Van Peenen et al. The collector's notation on the skin tag of the female likewise indicates that the total length is 615.

Although both of these Sontra Peak specimens are identified by Van Peenen et al. (1971, p. 134; cf. 1968, p. 609) as *M. fascicularis,* the field notes indicate that they were originally identified by the collectors as *M. mulatta.* Dorsal pelage of the available skin of the subadult female (USNM 356968) matches that of *M. fascicularis* FMNH 33505 (Vietnam: Ho Chi Minh City) and therefore confirms the identification made by Van Peenen et al. Because the skin of the adult male (USNM 356979) is lacking, its identification cannot be independently verified. This specimen may be either *M. fascicularis* or *M. mulatta*; Sontra Peak is near the border between the ranges of these parapatric species (Fooden, 1971, p. 28). At my request, P. F. D. Van Peenen recently reexamined his files, and he reports that he no longer has notes that would resolve this ambiguity (pers. comm., 27 Feb. 1992). Because of the unresolved ambiguity, data for the male (USNM 356979) are excluded from the present analysis of characters of *M. fascicularis.* In any event, the short tail of the subadult female (USNM 356968, relative T = 59.7%) is in accord with the pattern of tail reduction in *M. fascicularis* northward in the Indochinese Peninsula (see above). If the adult male (USNM 356979, relative T = 43.7%) had pelage characters of *M. fascicularis,* it would indicate that even more extreme tail reduction has occurred in this species at Sontra Peak. (Note: The tail also is relatively short in two infants and one juvenile—AMNH 87266, ANSP 15136, 15138—collected at nearby Muang Thateng, Laos.)

In a core-area adult female (BM(NH) 1939.181) collected in 1938 in West Malaysia at Bukit Nanas (formerly known as Weld's Hill; 3°09′N, 101°42′E), the tail is unusually short (T = 315 mm, relative T = 78.8%), considering the latitude of collection (Fig. 13). The tail also appears short in an adult male collected (date unknown) at the same locality (BM(NH) 1939.180, no collector's measurements; estimated relative T = ca. 75%, based on mea-

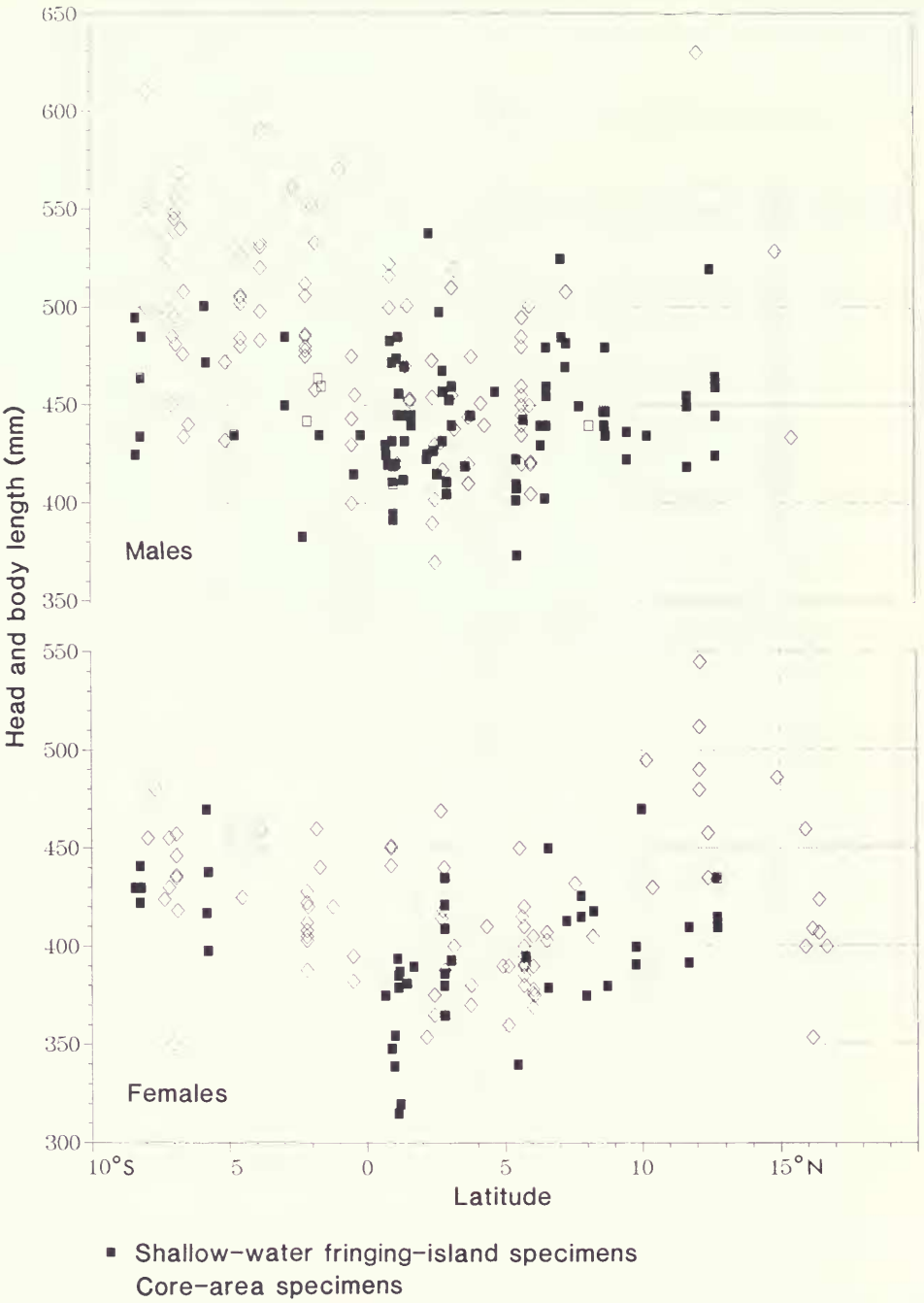

FIG. 11. Latitudinal variation of head and body length in adult shallow-water fringing-island specimens of *Macaca fascicularis* compared with that in adult core-area specimens (cf. Table 9 and Appendix 7).

surements of dry skin). In another adult male collected in 1913 at Bukit Nanas, T is normal (BM(NH) 1955.1512, T = 577 mm, relative T = 126.8%). Two additional short-tailed monkeys were observed at Bukit Nanas in 1966 (Bernstein, 1966, p. 1559; 1968a, p. 121); these two monkeys, which were associated with a troop of normal-tailed *M. fascicularis,* were inferred to be hybrids of *M. fascicularis* and *M. nemestrina.*

In fringing islands, T data are available for small

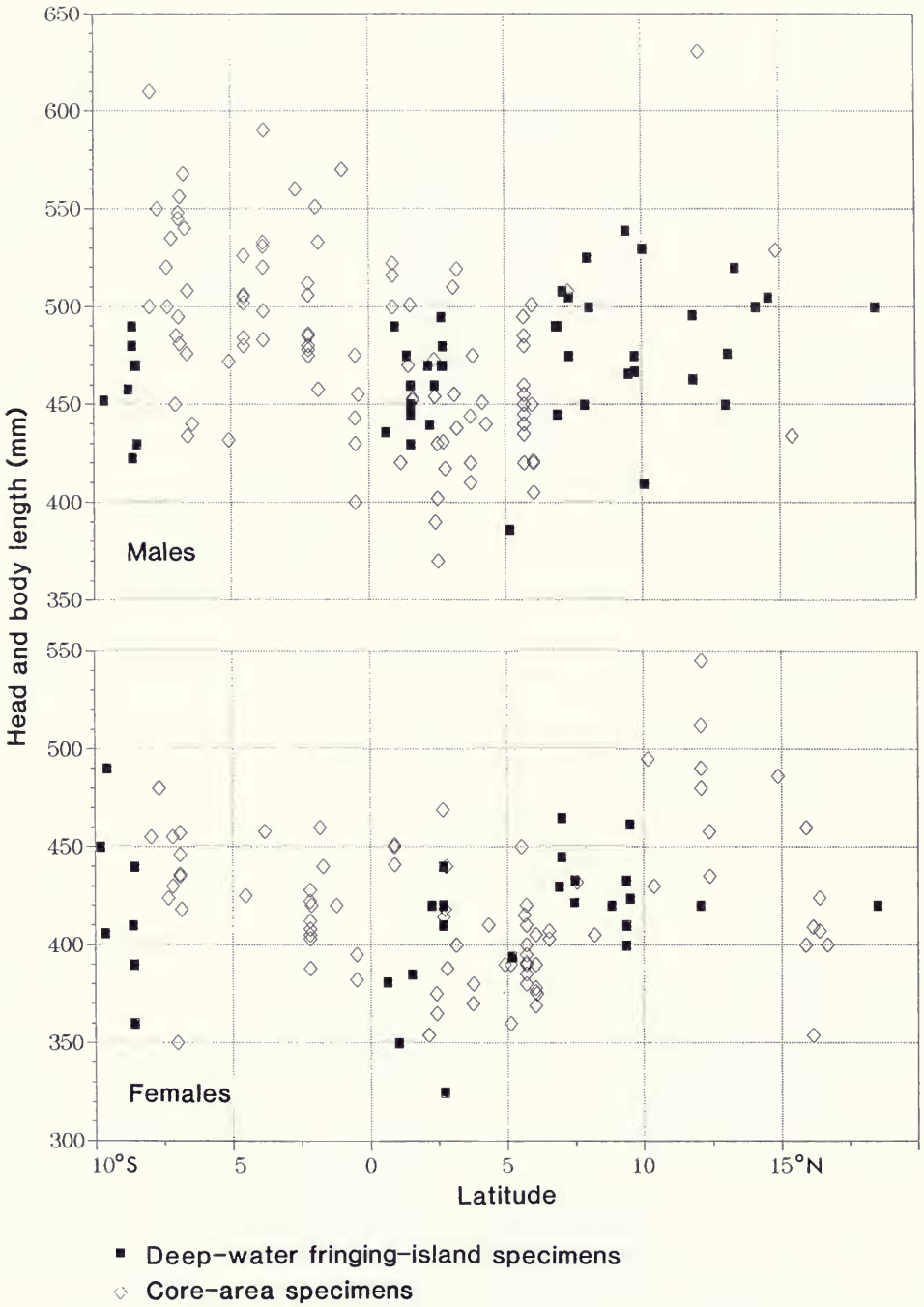

FIG. 12. Latitudinal variation of head and body length in adult deep-water fringing-island specimens of *Macaca fascicularis* compared with that in adult core-area specimens (cf. Table 9 and Appendix 7).

samples of adults collected in 57 shallow-water islands and 22 deep-water islands (Appendix 8). In shallow-water fringing islands, T is generally reduced relative to T in core-area samples collected at similar latitudes (Fig. 15, Table 11); this parallels the general reduction of HB in shallow-water fringing islands relative to HB in core-area reference samples (see above). In deep-water fring-

TABLE 10. Tail length and relative tail length in core-area *Macaca fascicularis*: summary of variation (cf. Figs. 13, 14).[1]

Sample area	Tail length			Relative tail length[2]		
	N	Mean ± SD	Extremes	N	Mean ± SD	Extremes
			Adult females			
Indochinese Peninsula[3]	16	434.4 ± 56.53	334–538	16	97.1 ± 10.95	76.1–114.7
Malay Peninsula[4]	11	481.5 ± 63.44	315–556	11	122.6 ± 16.78	78.8–143.3
Sumatra[5]	5	519.6 ± 12.18	508–535	5	124.0 ± 8.28	112.4–134.2
Borneo	43	507.3 ± 34.64	455–628	43	124.7 ± 9.78	110.2–144.0
Java	11	468.6 ± 52.37	345–555	11	108.5 ± 16.21	75.5–140.0
ALL	86	486.2 ± 52.91	315–628	86	117.2 ± 16.01	75.5–144.0
			Adult males			
Indochinese Peninsula[3]	3	513.3 ± 50.14	456–549	3	97.9 ± 11.28	84.9–105.1
Malay Peninsula[4]	13	579.3 ± 41.02	515–640	13	132.6 ± 12.30	102.0–149.5
Sumatra[5]	20	556.6 ± 38.59	490–623	20	115.3 ± 10.78	99.4–137.9
Borneo[6]	43	576.7 ± 45.93	470–680	42	122.4 ± 11.32	103.4–147.2
Java[7]	18	556.5 ± 84.86	360–715	18	110.1 ± 21.73	69.2–148.9
ALL	97	567.2 ± 54.33	360–715	96	119.2 ± 15.71	69.2–149.5
					Both sexes	
Indochinese Peninsula[3]				19	97.2 ± 10.68	76.1–114.7
Malay Peninsula[4]				24	128.0 ± 15.07	78.8–149.5
Sumatra				25	117.0 ± 10.76	99.4–137.9
Borneo				85	123.6 ± 10.57	103.4–147.2
Java				29	109.5 ± 19.52	69.2–148.9
ALL				182	118.3 ± 15.84	69.2–149.5

[1] Cf. J. Suzuki and Varavudhi (1989, pp. 111–113), who reported tail length in artificially provisioned troops of *M. fascicularis* in Thailand (cf. Aggimarangsee, 1992, p. 104)

[2] Relative tail length = tail length/head and body length × 100.

[3] Includes Isthmus of Kra north of 10°N.

[4] Includes Isthmus of Kra south of 10°N.

[5] Cf. Bakar et al. (1981, p. 12).

[6] One male specimen with tail length measurement lacks head and body measurement.

[7] Excludes bobtailed specimen MZB 6483, collected at Cikujang; HB = 540, T = 250, T/HB × 100 = 46.3.

ing islands, there is no general pattern of tail reduction (Fig. 16, Table 11). In deep-water P. Simuelue and P. Nias (both west of Sumatra) and in the deep-water Lesser Sunda Islands, T tends to be less than in core-area reference samples, but in the Nicobar Islands (northwest of Sumatra) and in many of the Philippine Islands, T tends to be greater than in core-area reference samples (Appendix 8).

The greatest reduction of T in fringing-island samples, relative to core-area reference samples, is evident in both sexes in P. Karimun and P. Bintan (both shallow-water islands east of Sumatra), P. Tioman (shallow-water, east of the Malay Peninsula), and P. Simeulue and P. Nias (deep-water, west of Sumatra) (Figs. 15, 16; Appendix 8). T reduction may also be large in P. Pintu Gedong (west of the Malay Peninsula), P. Bangka (east of Sumatra), Ko Samui (east of the Isthmus of Kra), and P. Belitung (west of Borneo), shallow-water islands known from male samples only. The tail is unusually long in a male specimen collected in P. Acheh (shallow-water, east of the Malay Peninsula, T = 698 mm; cf. Fig. 15). In P. Pinang [1] (shallow-water, west of the Malay Peninsula), one member of a troop of *M. fascicularis* had a deformed tail (Lee Chin Thuan, 1964, p. 172).

Relative T in shallow-water fringing-island samples is generally similar to relative T in core-area samples collected at similar latitudes (Fig. 17, Appendix 9); this implies that HB and T tend to be similarly reduced in shallow-water fringing-island populations, relative to HB and T in corresponding core-area populations. Conspicuous exceptions occur in P. Tioman (east of the Malay Peninsula), where T is more reduced than HB, and, conversely, in Ko Khram Yai (south of the Indochinese Peninsula), where HB is more reduced than T (cf. Figs. 11, 15).

Relative T in deep-water fringing-island samples frequently deviates from relative T in core-area samples collected at similar latitudes (Fig. 18,

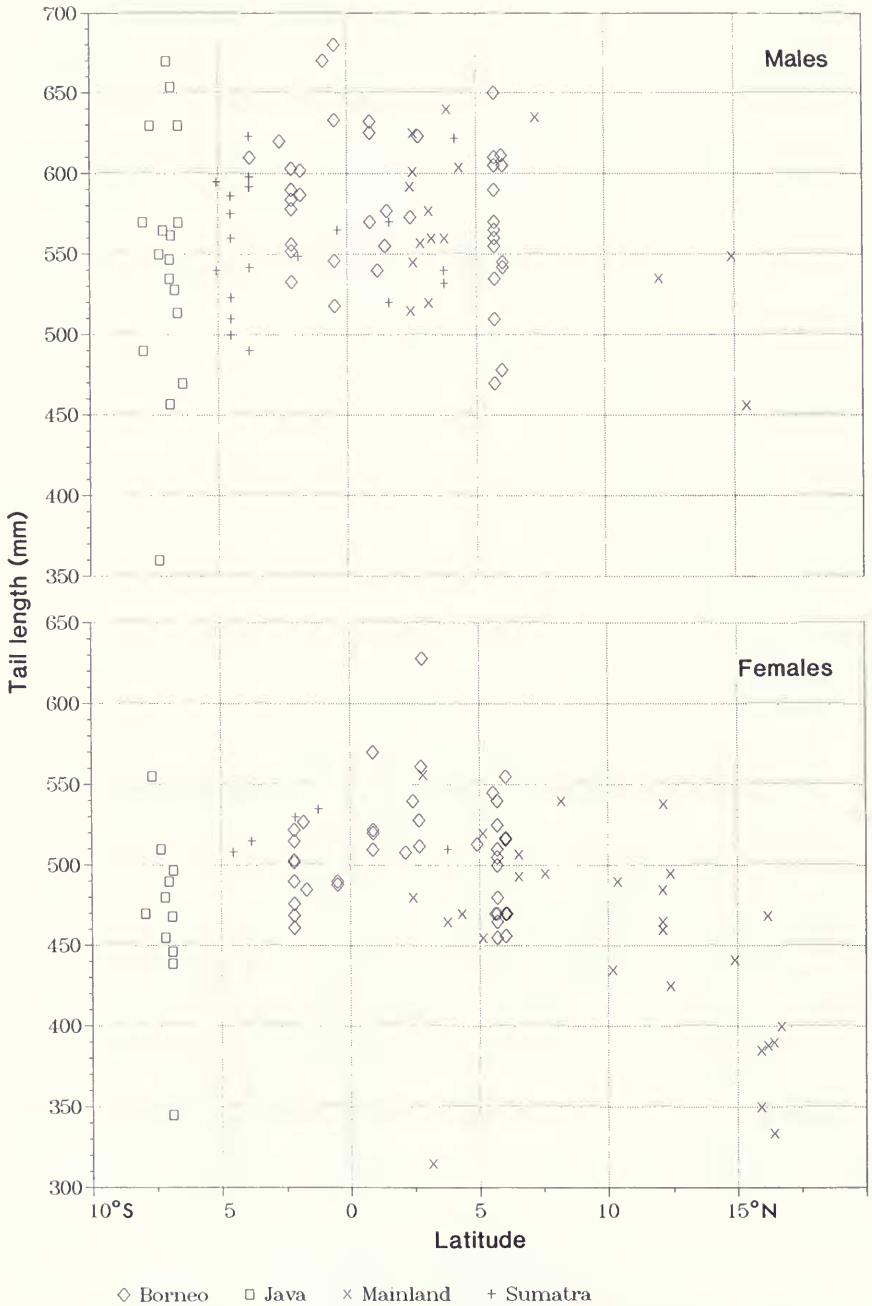

FIG. 13. Latitudinal variation of tail length in adult core-area specimens of *Macaca fascicularis* (cf. Table 10).

Appendix 9). Relative T in P. Simeulue and P. Nias (west of Sumatra) is significantly less than at corresponding latitudes in West Malaysia, Sumatra, and Borneo, and relative T in Mindoro and Luzon (northern Philippines) is significantly greater than at corresponding latitudes in the Indochinese Peninsula. In P. Simeulue and P. Nias, T is more reduced than HB, relative to HB and T in West Malaysia, Sumatra, and Borneo; in Mindoro and Luzon, both HB and T are increased—the latter more than the former—relative to HB and T in the Indochinese Peninsula, where both

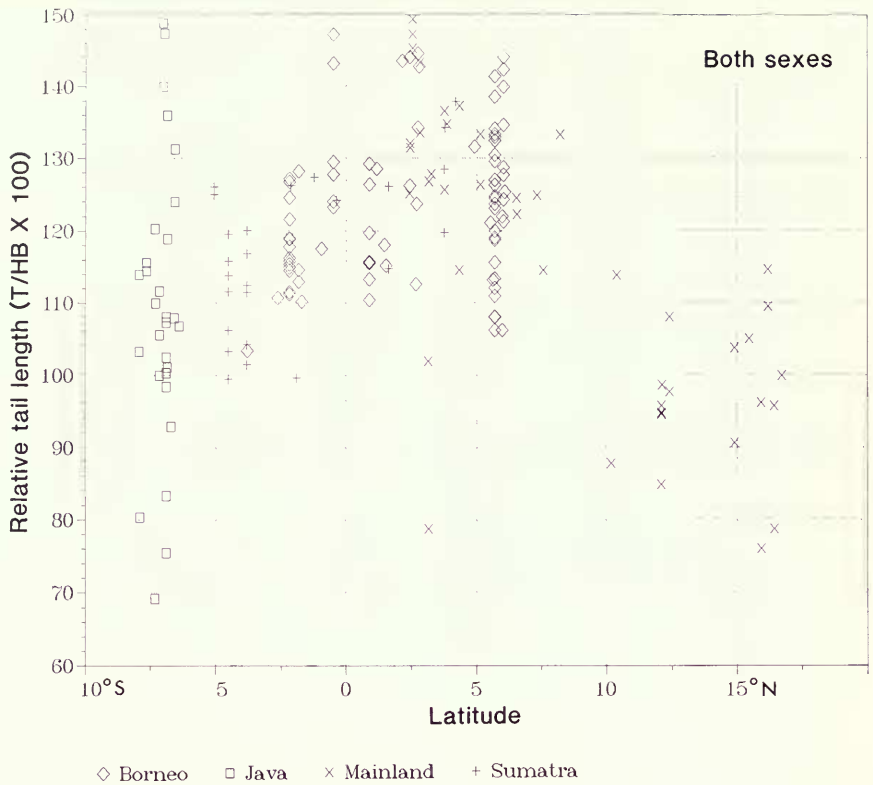

FIG. 14. Latitudinal variation of relative tail length in adult core-area specimens of *Macaca fascicularis* (cf. Table 10).

of these measurements decrease latitudinally (cf. Figs. 10, 13). In the deep-water Lesser Sundas, as in Bali (cf. Fig. 17), HB and T tend to be isometrically reduced, relative to HB and T in Java.

Cranial Characters

Sex and Age Variation (Figs. 19, 20)

In wild-collected *M. fascicularis,* greatest length of skull (GL) in adult males (118.7 mm, n = 454) averages approximately 18% greater than in adult females (100.4 mm, n = 439) (Table 12). Zygomatic arches are relatively narrow in both sexes; relative zygomatic breadth (ZB/GL × 100) averages 67.9 in 440 males and 65.9 in 428 females. The rostrum is relatively long and narrow, particularly in males; the rostral–postrostral ratio (R/PR × 100) averages 56.7 in 316 males and 47.6 in 241 females. Supramaxillary ridges and lateral maxillary concavities vary from weakly to strongly defined in both sexes. Canines in males are relatively large. A median sagittal crest, formed by progressive convergence of the temporal lines, is prominent in many old males.

During development from infancy to adulthood, zygomatic breadth increases slightly more rapidly than skull length, and rostral length increases much more rapidly than postrostral length (Table 12; cf. N. Fujiwara, 1963, p. 57; Morimoto, 1982, p. 98; Nanda et al., 1987, p. 217). Recent studies indicate that the conspicuous sexual dimorphism of R/PR in adult *M. fascicularis* probably is a result of both a higher rate and a greater duration of allometric growth of the rostrum in males (Ravosa, 1991, p. 408; Richtsmeier et al., 1993a, p. 28); prenatal and postnatal growth patterns contribute differentially to development of adult cranial morphology (Richtsmeier et al., 1993b, p. 322). Fluctuating asymmetry of the skull generally increases with age (Halgrimsson, 1993, p. 431).

The sequence and timing of dental emergence

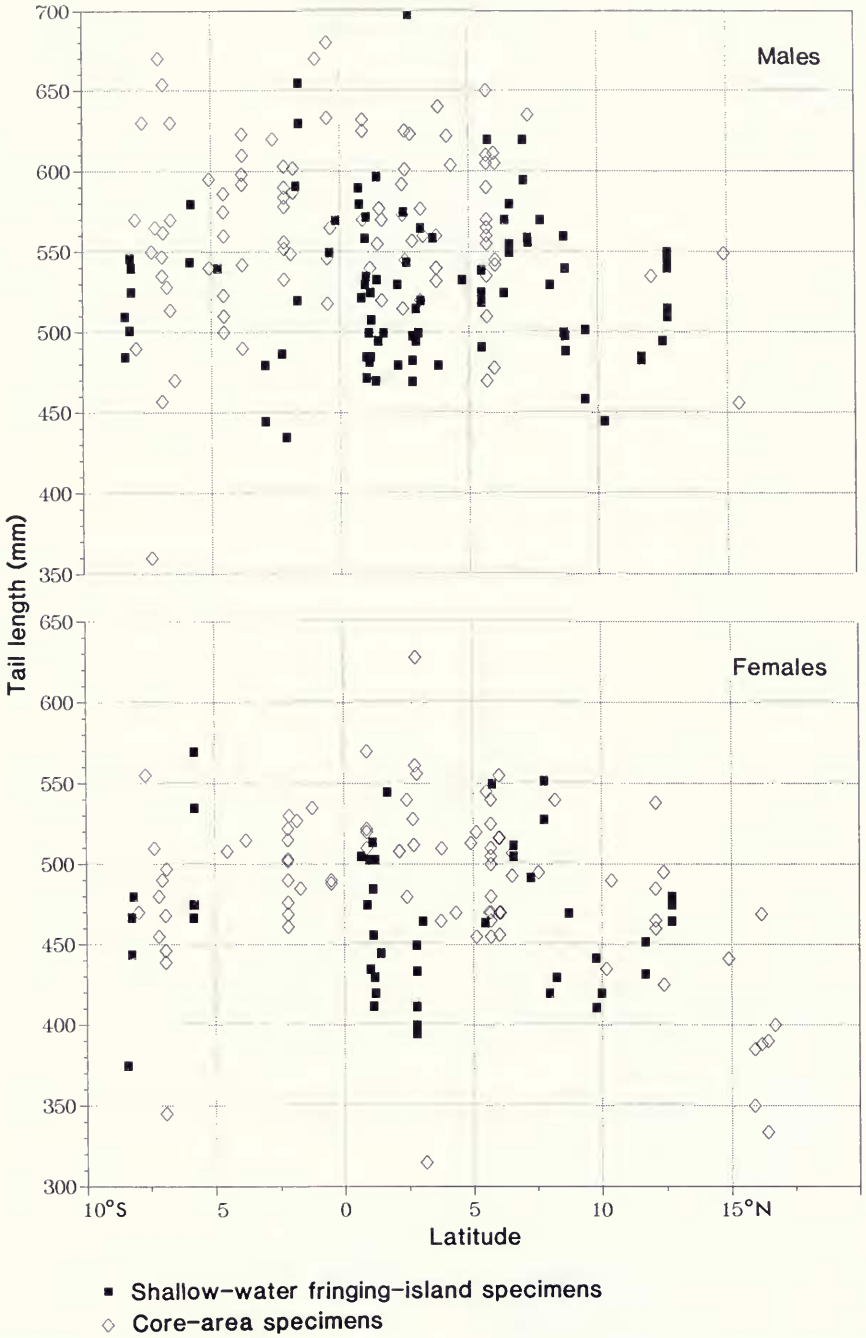

FIG. 15. Latitudinal variation of tail length in adult shallow-water fringing-island specimens of *Macaca fascicularis* compared with that in adult core-area specimens (cf. Table 11 and Appendix 8).

in captive *M. fascicularis* have been investigated by Spiegel (1952, p. 127), Berkson (1968, p. 354), Bowen and Koch (1970, p. 118), B. H. Smith et al. (1994, pp. 214, 226), and Ostyn et al. (1995, p. 250). Results of these investigations are in general agreement (Tables 13, 14; cf. Richtsmeier et al., 1993a, p. 4); however, Bowen and Koch (1970, p. 114) cautioned that the timing of dental emer-

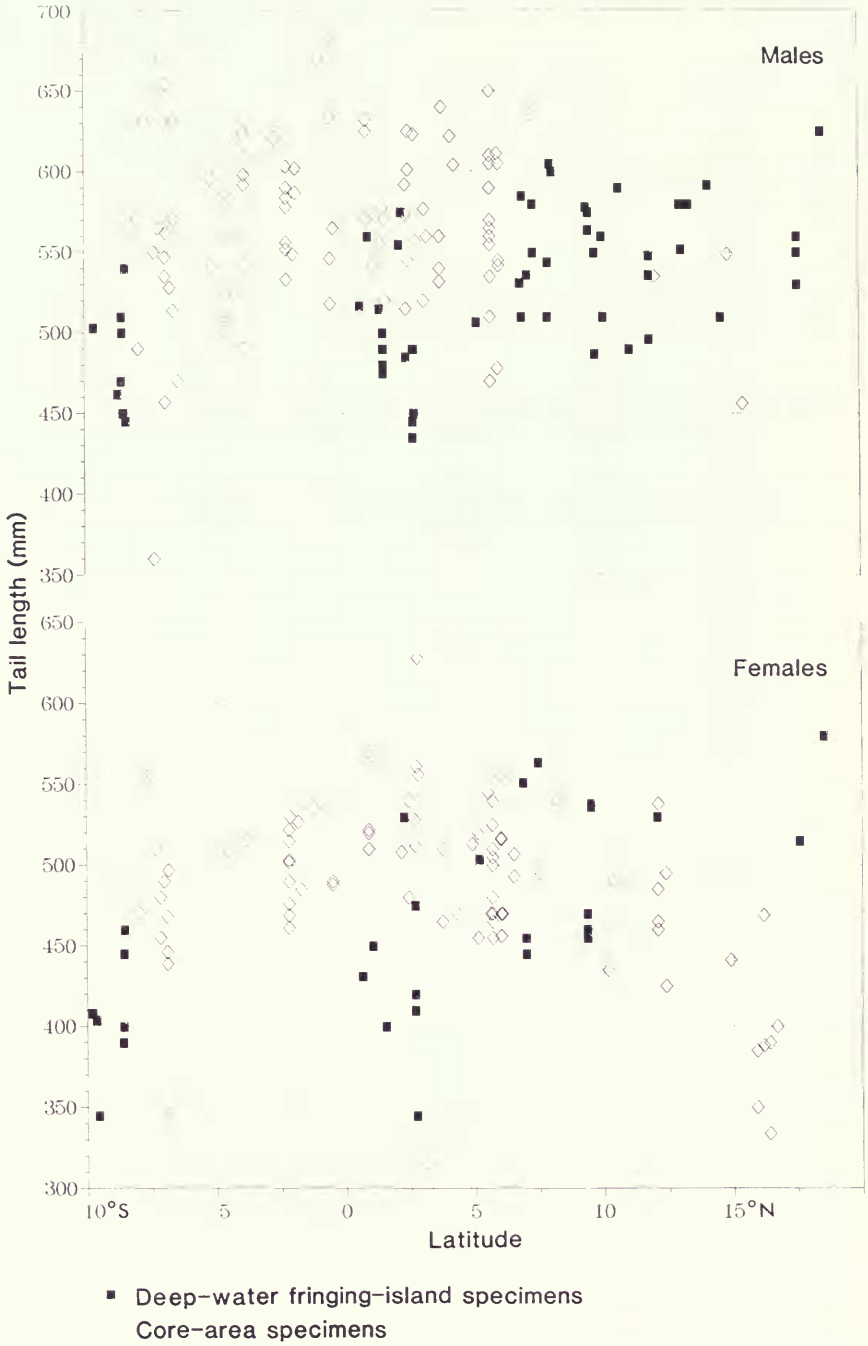

FIG. 16. Latitudinal variation of tail length in adult deep-water fringing-island specimens of *Macaca fascicularis* compared with that in adult core-area specimens (cf. Table 11 and Appendix 8).

gence in captivity may not be identical to that in natural populations.

In captivity, the first deciduous tooth (i_1) may emerge (i.e., penetrate the gingiva) before birth, and the last deciduous tooth (m^2) apparently emerges before age 10 months (Table 13); no sexual differences have been observed in timing or sequence of emergence of deciduous teeth (Spiegel,

TABLE 11. Summary comparison of tail length and relative tail length (T/HB × 100) in fringing-island (FI) and core-area (CA) samples of *Macaca fascicularis*.[1] For details, see Appendixes 8 and 9.

Categories of FI samples	Shallow-water FI samples			Deep-water FI samples		
	Number of islands	FI > CA[2]	CA > FI[3]	Number of islands	FI > CA[2]	CA > FI[3]
Tail length						
1. FI sample includes both sexes						
a. Sexes in FI sample deviate concordantly from those in CA sample	15	4	11	8	3	5
b. Sexes in FI sample deviate discordantly from those in CA sample						
1) Females, FI > CA; males, CA > FI	2	1	1	2	1	1
2) Females, CA > FI; males, FI > CA	1	0.5	0.5	0	0	0
2. FI sample includes only one sex						
a. Females	8	0	8	2	1	1
b. Males	31	6	25	10	3	7
TOTALS	57	11.5	45.5	22	8	14
Relative tail length						
All samples (including both sexes)	57	25	32	21	8	13

[1] Samples for tail length differ slightly from those for relative tail length because both head and body length and tail length are not available for all specimens.
[2] FI sample mean exceeds CA sample mean.
[3] CA sample mean exceeds FI sample mean.

1952, p. 129; 16 females, 22 males, not all teeth studied in all specimens). The first permanent tooth (M_1) may emerge as early as age 1.2 years, and the last permanent tooth (M^3) may not emerge until age 9.5 years (Table 14). The permanent canines of males emerge approximately 1 year later (C_1, age 4.4 yr; C^1, age 4.8 yr) than the much smaller permanent canines of females. Spiegel (1952, p. 128) indicated that the interval between initial emergence of a tooth and complete eruption to its final height is 1–2 months for most teeth, somewhat longer for third molars, and several years for male canines.

Geographic Variation

In core-area specimens examined, skull length varies latitudinally (Table 15, Fig. 21), mostly in accord with Bergmann's rule, as previously reported by Fooden and Albrecht (1993, p. 525). In both sexes, skull length is high in Java (ca. 7°S), decreases to a minimum in Sumatra and Borneo (ca. 0°), increases to a second peak in the northern part of the Isthmus of Kra (ca. 12°30′N), and decreases farther northward—contrary to Bergmann's rule—in the Isthmus of Kra and Indochinese Peninsula (northernmost measured specimens collected ca. 17°N). Within each sex, skull length is approximately equal in specimens collected at similar latitudes in the Malay Peninsula, Sumatra, and Borneo; a similar latitudinal homogeneity of skull length in these three disjunct landmasses was previously noted in *M. nemestrina* (Fooden, 1975, p. 85).

Four core-area skulls stand out as aberrantly large for their latitudes of collection (Fig. 21). Of these, one female skull (BM(NH) 1939.181, GL = 119.2 mm) and one male skull (BM(NH) 1939.180, GL = 132.0 mm), both collected in West Malaysia at Bukit Nanas (3°09′N), belong to specimens that were previously cited for their aberrantly short tails (see above, External Measurements and Proportions); another adult male (BM(NH) 1955.1512, GL = 116.9 mm) collected at Bukit Nanas has a skull and tail of normal length. The other two aberrantly large skulls were collected at widely separated localities in Borneo—a female (FMNH 68700, GL = 115.8 mm) in Sabah at Kretam Besar (5°32′N) and a male (USNM 521837, GL = 131.0 mm) in Kalimantan at Hantakan (2°38′S); the tail is of normal length in both of these specimens. Collectors' measurements of head and body length are available for three of the four specimens with aberrantly large skulls (all except BM(NH) 1939.180); in these three specimens, HB is large, but not aberrantly so.

In shallow-water fringing islands, geographic

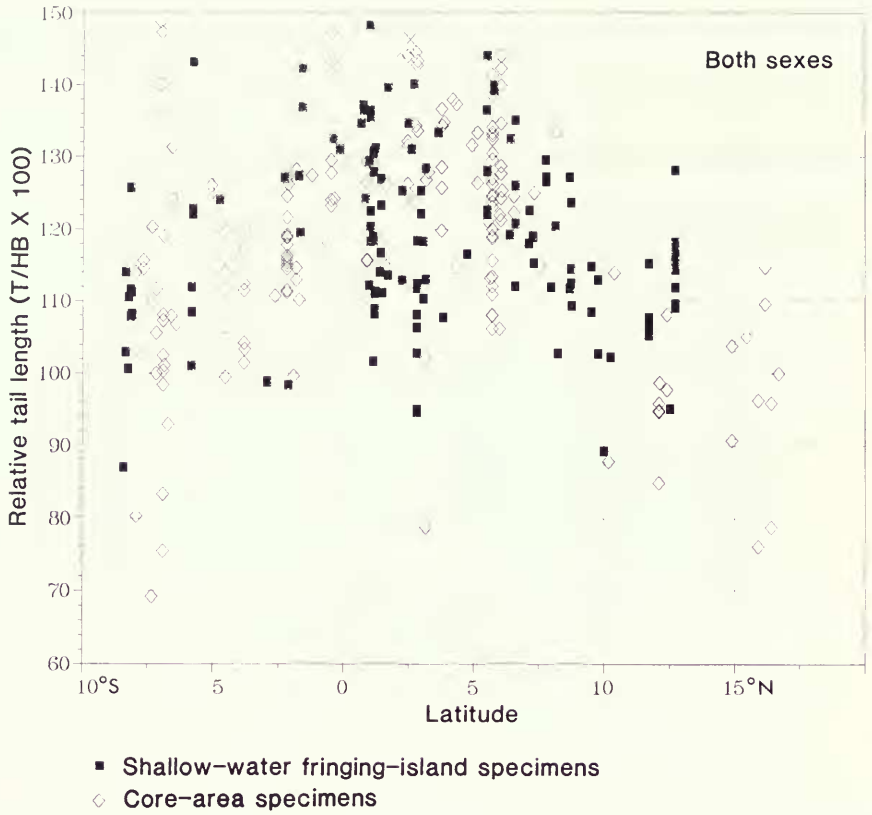

FIG. 17. Latitudinal variation of relative tail length in adult shallow-water fringing-island specimens of *Macaca fascicularis* compared with that in adult core-area specimens (cf. Table 11 and Appendix 9).

variation of skull length also is in general accord with Bergmann's rule, but skull length, like HB (see above), tends to be somewhat smaller in these islands than in core-area populations at similar latitudes (Fig. 22, Table 16); this indicates a general tendency toward insular dwarfism in shallow-water fringing islands (cf. Fooden & Albrecht, 1993, p. 525). For four shallow-water fringing islands, samples are sufficiently large to establish that both females and males are significantly smaller than in core-area reference samples; these islands are P. Bintan (Indonesia: Riau Archipelago, 1°09′N), P. Tioman (West Malaysia: east coast, 2°48′N; including one aberrantly small male, USNM 101744, GL = 97.4 mm), Ko Kut (Thailand: southeast coast, 11°40′N), and Bali (Indonesia: Lesser Sunda Islands, 8°15′S). In five shallow-water fringing-island samples, skull length may be larger than in core-area reference samples; four of these islands are in the Java Sea, between Borneo and Java (Indonesia: P. Karimunjawa, 5°51′S; P. Kemujan, 5°51′S; P. Bawean, 5°48′S; P. Matasiri, 4°47′S), and one is north of Borneo (Sabah: P. Banggi, 7°09′N).

In deep-water fringing islands, a tendency toward insular dwarfism is evident only in the Lesser Sunda Islands (8°32′–9°42′S) (Fig. 23, Table 16); skull length variation in deep-water Lesser Sunda Islands is similar to that in Bali, the only shallow-water Lesser Sunda Island (cf. Fig. 22). Skull length in deep-water fringing islands tends to be greater than in core-area reference samples in the Nicobar Islands (6°58′–8°00′N), northwest of Sumatra; in P. Simeulue (2°39′N) and nearby P. Lasia (2°10′N), west of Sumatra; and probably in P. Maratua (2°15′N), east of Borneo (cf. Fooden & Albrecht, 1993, p. 531). In the Philippine Islands (5°24′–18°31′N), skull length tends to increase with latitude, extending the Bergmannian trajectory evident in core-area populations between the equator and about 12°30′N (Fig. 23; Fooden, 1991, p. 10); variation of skull length in Philippine samples collected north of about 12°30′N does not follow the anti-Bergmannian trajectory evident in core-area

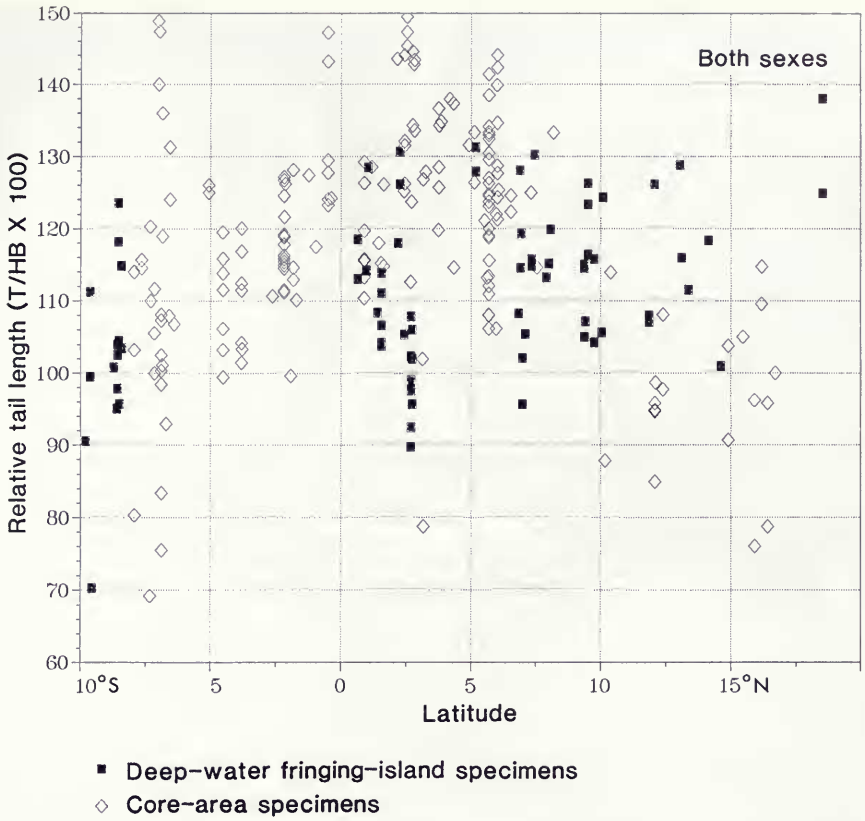

FIG. 18. Latitudinal variation of relative tail length in adult deep-water fringing-island specimens of *Macaca fascicularis* compared with that in adult core-area specimens (cf. Table 11 and Appendix 9).

samples collected at similar latitudes in the Isthmus of Kra and Indochinese Peninsula. Skull length is aberrantly small in one male specimen collected at Mahayahaya (13°55′N; GL = 109.3 mm), Luzon, Philippines.

Molecular Biology and Genetics

Mitochondrial DNA

In a unique and valuable series of studies, Harihara et al. (1986, p. 357; 1988, p. 118; 1991, p. 611) have employed five restriction enzymes to investigate restriction fragment length polymorphism in the mitochondrial DNA (mtDNA) of six geographic samples of *M. fascicularis* (Table 17). One of these samples consists of five captive-born individuals—one born to a female imported from Vietnam and four born to females imported from Cambodia. Two samples consist of a total of 98 individuals livetrapped in Thailand; one of these samples originated north of the Isthmus of Kra (≤ 7 localities), and the other originated south of the Isthmus of Kra (2 localities). Each of the other three samples consists of 48 individuals, imported, respectively, from Malaysia, Indonesia, and the Philippines. For the last three samples, no further details are available concerning the regions or islands of origin of individuals in the samples or concerning possible geographic heterogeneity within the samples (Harihara et al., 1986, p. 357; 1988, p. 125); this is unfortunate, because Malaysia, Indonesia, and the Philippines each include widely dispersed landmasses inhabited by isolated populations of *M. fascicularis.*

In Table 17, the six sample areas of Harihara et al. are arranged in approximate geographic order. They are: (1) Vietnam and Cambodia, both east of (2) Thailand north of the Isthmus of Kra, which obviously is north of (3) Thailand south of the Isthmus of Kra; the latter sample area is north of (4) West Malaysia and northwest of East Malaysia

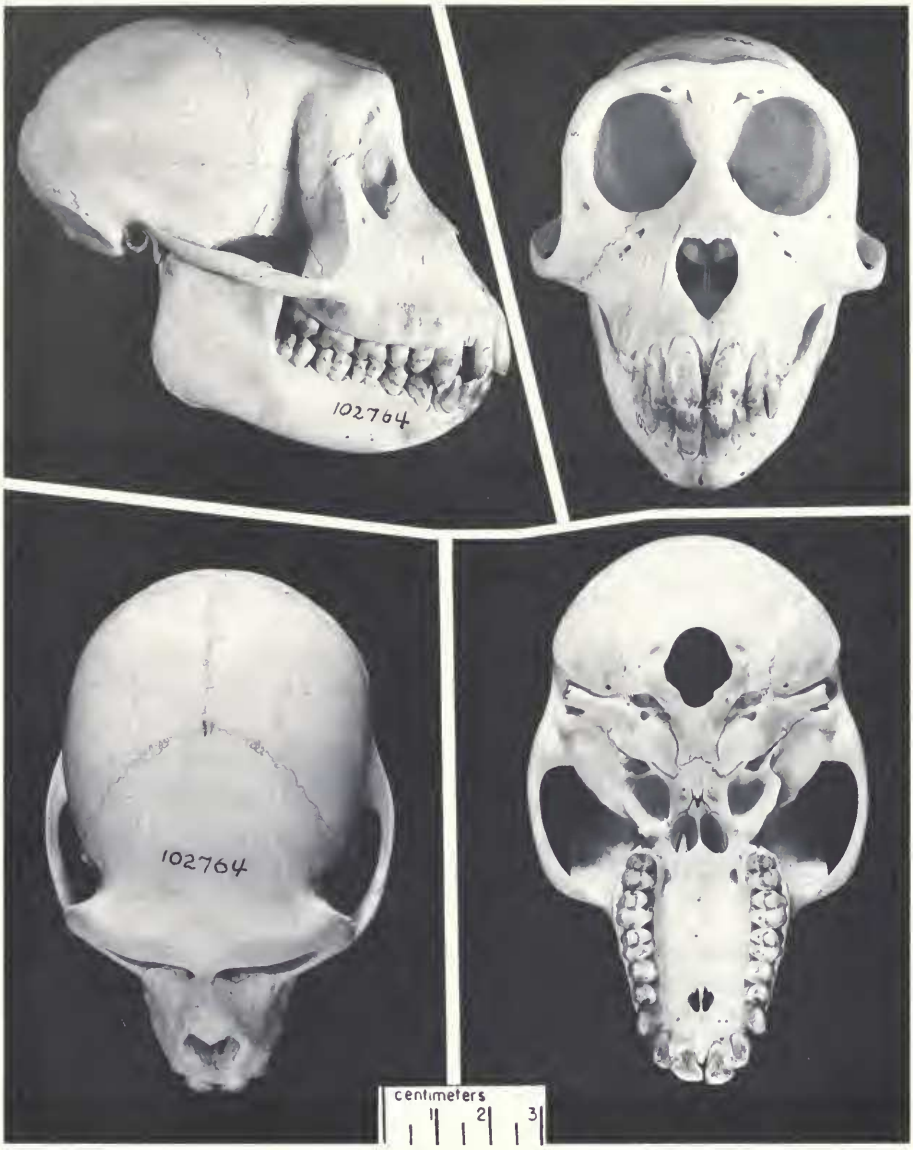

FIG. 19. Skull of adult female *Macaca fascicularis,* near topotype—AMNH 102764, Indonesia: Sumatra, Muaradua. (Photographs by James L. Balodimas, Division of Photography, FMNH.)

(Sarawak and Sabah, both in Borneo); West and East Malaysia, together considered one sample area, are mostly north of (5) Indonesia; and Malaysia and Indonesia are southwest of (6) the Philippine Islands. In the absence of information concerning whether any members of the Malaysian and/or Indonesian samples originated in Borneo, the geographic relationship of the Philippine sample to the Malaysian and Indonesian samples remains ambiguous.

For the four initially studied non-Thai samples, treatment of *M. fascicularis* mtDNA with each of the five restriction enzymes yielded three to six distinctive digestion patterns (enzyme morphs), as follows: *Bam*HI and *Eco*RI, three morphs each; *Hpa*I and *Sst*I, four morphs each; and *Hin*dIII, six morphs (Table 17). In the 149 individuals included in these four samples, 21 different combinations (mtDNA types) of these enzyme morphs were detected. In the 98 individuals included in the two subsequently studied Thai samples, four additional enzyme morphs and three additional

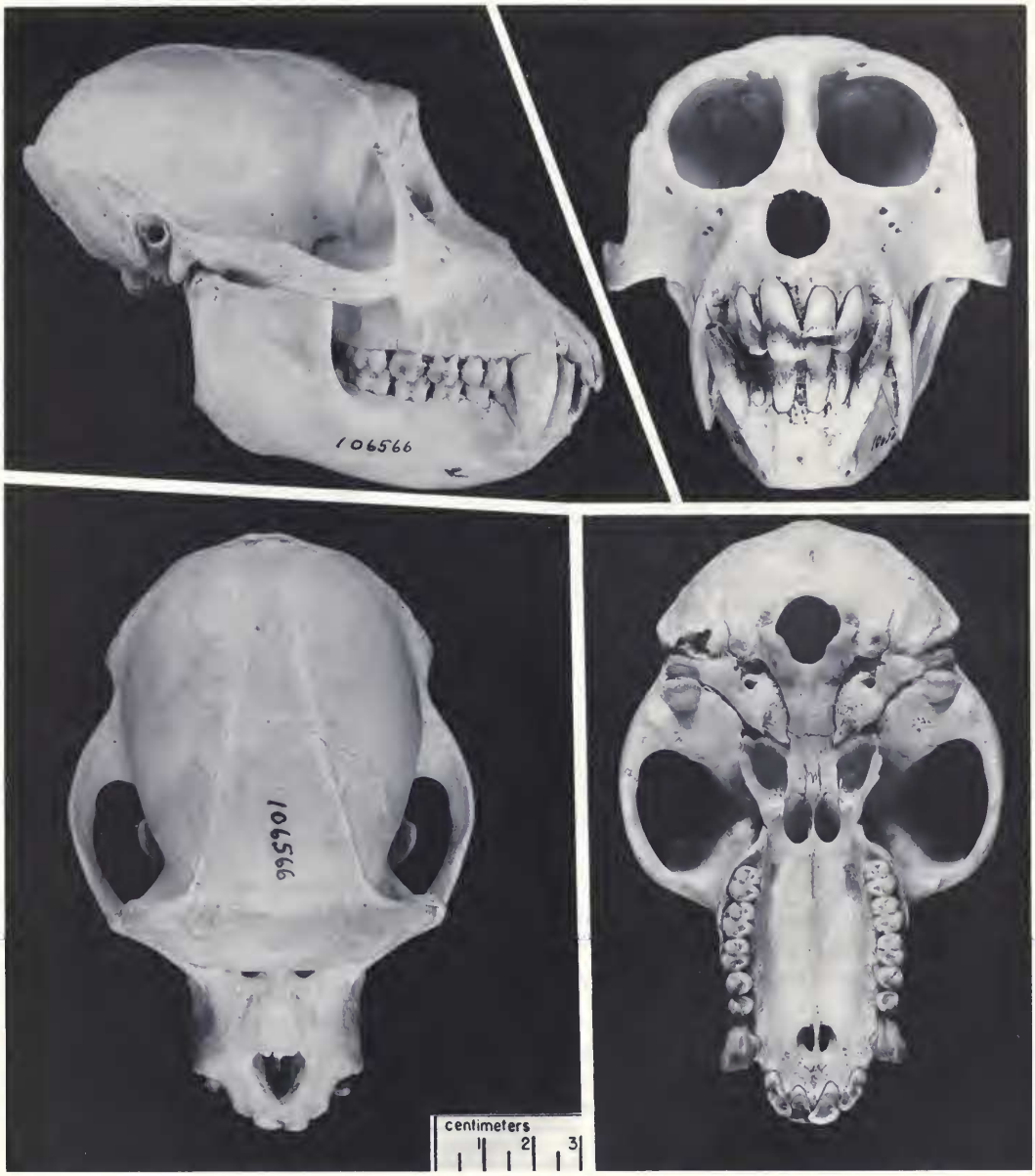

FIG. 20. Skull of adult male *Macaca fascicularis*, near topotype—AMNH 106566, Indonesia: Sumatra, Bukit Sanggul. (Photographs by James L. Balodimas, Division of Photography, FMNH.)

mtDNA types were detected; at each locality in these two samples, all individuals were uniform in their mtDNA type (Harihara et al., 1991, p. 611).

Except for the peculiar mtDNA type in the Thailand south of the Isthmus of Kra sample (Harihara et al., 1991, p. 612), the distribution of enzyme morphs and mtDNA types in samples generally conforms to the geographic relationships of samples (Table 17; cf. Melnick & Hoelzer, 1993, p. 3). Although the small Indochinese sample shares neither of its two mtDNA types with other samples, it resembles the Malaysian sample in its high frequency of *Sst*I morph 2. Mitochondrial DNA types in the Thailand north of the Isthmus of Kra sample are closely related to those in the Indochinese and Malaysian samples (Harihara et al., 1991, p. 612). The Indonesian sample (10 mtDNA types), which

TABLE 12. Cranial measurements[1] and proportions in age/sex classes of wild-collected *Macaca fascicularis*.[2]

Age/sex class[3]	Greatest length (mm)	Relative zygomatic breadth (ZB/GL × 100)	Postrostral length (mm)	Rostral-postrostral ratio (R/PR × 100)
Fetuses	60.8 (*1*)	56.7 (*1*)	52.0 (*1*)	23.7 (*1*)
Infants	75.9 ± 6.21 56.0–93.7 (*80*)	63.1 ± 2.48 57.0–68.8 (*78*)	64.2 ± 4.11 50.6–70.8 (*57*)	25.7 ± 3.60 18.2–34.1 (*57*)
Juveniles	93.3 ± 9.40 72.2–130.0 (*482*)	64.6 ± 2.44 57.0–78.1 (*476*)	71.8 ± 4.08 62.7–85.4 (*287*)	40.6 ± 6.28 28.3–55.5 (*287*)
Subadult females	97.6 ± 4.54 89.7–109.9 (*70*)	65.6 ± 2.54 60.2–72.9 (*69*)	73.3 ± 3.12 67.2–80.2 (*40*)	44.0 ± 3.23 37.7–51.5 (*40*)
Subadult males	111.5 ± 6.70 95.7–128.0 (*123*)	66.9 ± 2.72 59.8–75.4 (*122*)	78.4 ± 3.52 70.2–88.1 (*92*)	53.0 ± 4.28 42.3–63.4 (*92*)
Adult females	100.4 ± 5.63 84.0–119.2 (*439*)	65.9 ± 2.40 59.4–74.1 (*428*)	74.0 ± 3.26 64.3–87.2 (*241*)	47.6 ± 4.21 36.9–61.0 (*241*)
Adult males	118.7 ± 7.29 97.4–140.1 (*454*)	67.9 ± 2.66 59.8–76.4 (*440*)	80.9 ± 4.02 70.6–93.1 (*316*)	56.7 ± 3.94 41.9–66.3 (*316*)

[1] For definition of measurements, see Fooden (1969, p. 40).
[2] Mean ± SD (where n > 2), extremes, and sample size (italicized figures in parentheses).
[3] Dental specifications: infants, deciduous teeth only; juveniles, some permanent teeth erupted; subadults, M3 in females or C in males incompletely erupted (cf. Spiegel, 1952, p. 129); adults, all permanent teeth completlely erupted.

may be geographically intermediate between the Malaysian and Philippine samples (see above), shares 2 mtDNA types with the Malaysia sample (9 mtDNA types) and shares 2 other mtDNA types with the Philippine sample (4 mtDNA types). The Philippine sample shares no mtDNA types with any sample other than that from Indonesia (cf. Lawler et al., 1995; p. 137). Known genetic dis-

TABLE 13. Schedule of emergence of deciduous teeth in captive *Macaca fascicularis*[3]; emergence age in days.

	Spiegel (1952, p. 131)			Berkson (1968, p. 355)			Bowen and Koch (1970, p. 118)		
Tooth	Mean	Extremes	N	Median[4]	Extremes	N	Mean	Extremes	N
i_1	14	0–41	37	30	15–75	10	18	7–35	18
i^1	18	5–39	37	30	15–75	10	20	7–42	18
i_2	26	0–58	37	30	30–75	10	36	14–49	18
i^2	40	18–77	37	45	30–75	10	47	21–63	18
c_1	71	28–187	37	75	45–105	10	72	35–98	18
c^1	77	28–173	36	75	45–105	10	75	35–91	16
m_1	66	35–98	37	90	75–120	10	74	56–91	20
m^1				90	75–120	10	72	56–98	17.5[5]
m_2	154	98–252	36	165	150–210	10	176	119–287	18
m^2	168	105–280	36	180	150–225	10	189	119–238	18

[1,2] Designate positions of teeth.
[3] Cf. B. H. Smith et al. (1994, p. 214), who cite the following mean emergence ages (days) without specifying sample sizes or extreme values: i_1, 14; i^1, 21; i_2, 28; i^2, 33; c_1, 76; c^1, 76; m_1, 76; m^1, 76; m_2, 167; m^2, 198.
[4] Estimated to nearest half month.
[5] Examined unilaterally in one subject.

TABLE 14. Schedule of emergence of permanent teeth in captive *Macaca fascicularis*[5]; emergence age in years.

	Spiegel (1952, p. 134)[6]						Bowen and Koch (1970, p. 119)		
	Females			Males			Both sexes		
Tooth	Mean	Extremes	N	Mean	Extremes	N	Mean	Extremes	N[7]
M_1	1.38	1.23–1.69	13	1.54	1.38–1.85	10	1.34	1.17–1.50	16
M^1	1.54	1.31–1.92	13	1.69	1.46–2.08	10	1.46	1.17–1.67	15
I_1	2.38	2.08–3.23	10	2.46	2.08–2.69	8	2.40	1.92–2.75	10
I^1	2.38	2.31–3.00	10	2.54	2.31–2.92	8	2.41	1.92–2.83	10.5
I_2	2.62	2.38–2.92	10	2.62	2.15–2.08	8	2.54	2.08–2.83	6.5
I^2	2.85	2.38–3.15	10	2.92	2.85–3.38	8	2.68	2.17–3.08	6.5
M_2	3.38	3.00–3.69	10	3.38	2.92–3.69	8	3.68	3.33–3.83	3
M^2	3.54	3.23–3.92	8	3.46	3.00–3.85	8	3.83	3.33–4.08	1.5
P_3	3.62	3.23–4.38	10	4.00	3.15–5.08	8	3.68	3.33–3.83	3
P^3							3.60	3.08–3.83	3
P_4	3.92	3.46–4.62	9				3.68	3.33–3.83	3
P^4							3.79	3.25–4.08	1.5
C_1	3.38	3.00–3.92	10	4.38	3.85–4.69	8	3.52	3.00–4.08	3
C^1	3.85	3.23–4.38	10	4.77	4.08–5.15	8	3.94	3.33–4.25	1.5
M_3	5.54	5.31–7.69	3	6.00	5.38–6.46	6	—	—	—
M^3	6.23	5.92–9.54	3	6.46	5.69–6.62	6	—	—	—

[1–4] Designate positions of teeth.

[5] Cf. B. H. Smith et al. (1994, p. 226), who cite the following mean emergence ages (yr) in females without specifying sample sizes or extreme values: M_1, 1.50; M^1, 1.75; I_1, 2.50; I^1, 2.50; I_2, 2.50; I^2, 2.50; M_2, 3.25; M^2, 3.25; P_3, 3.50; P^3, 3.25; P_4, 3.50; P^4, 3.25; C_1, 3.00; C^1, 3.25; M_3, 5.50; M^3, 6.00. Also cf. Ostyn et al. (1995, p. 250), who provide the following emergence ages (yr; mean ± SD) for six teeth: females (n = 3)—M_1, 1.33 ± 0.09; M^1, 1.46 ± 0.09; I_1, 2.54 ± 0.16; I^1, 2.70 ± 0.08; I_2, 2.70 ± 0.08; I^2, 2.85 ± 0.19; males (n = 6, except I^2, n = 4)—M_1, 1.35 ± 0.11; M^1, 1.53 ± 0.10; I_1, 2.48 ± 0.21; I^1, 2.50 ± 0.23; I_2, 2.57 ± 0.24; I^2, 2.70 ± 0.30.

[6] In the present table, Spiegel's data are converted from "Messjahres" to calendar years [calendar years = (Messjahre × 48/52) + (Messmonate × 4/52)]; cf. Spiegel (1952, p. 127, footnote 2).

[7] Decimal fractions indicate unilateral examination of subjects.

tances between sample pairs also generally conform to geographic relationships (Table 17, footnote 1). Further interpretation of the taxonomic and phylogenetic significance of these mtDNA data is hindered by the imprecise provenance and possible geographic heterogeneity of the samples from Malaysia, Indonesia, and the Philippines.

Nuclear DNA

MULTIPLE ALPHA-GLOBIN GENES—Restriction-endonuclease analysis of *M. fascicularis* DNA (n = 168) indicates that individuals of this species have from one to four alpha-globin genes per haploid genome and that the frequency of alpha-glo-

TABLE 15. Greatest length of skull in core-area *Macaca fascicularis*: summary of variation[1] (see Fig. 21).

	Adult females			Adult males		
Sample area	N	Mean ± SD	Extremes	N	Mean ± SD	Extremes
Indochinese Peninsula[2]	22	105.0 ± 6.50	95.7–116.2	10	123.9 ± 5.12	116.4–132.3
Malay Peninsula[3]	13	101.9 ± 7.33	92.6–119.2	20	115.0 ± 7.05	106.6–132.0
Sumatra	39	98.4 ± 3.42	93.1–103.9	80	116.2 ± 4.37	107.4–128.2
Borneo	71	99.1 ± 4.40	89.7–115.8	69	115.6 ± 5.36	103.2–133.5
Java	40	104.3 ± 4.26	97.0–114.0	44	126.3 ± 5.76	115.9–138.1
ALL	185	101.0 ± 5.40	89.7–119.2	223	118.2 ± 6.81	103.2–138.1

[1] Includes specimens without precise localities that are excluded in Fooden and Albrecht (1993, p. 537).

[2] Includes Isthmus of Kra north of 10°N.

[3] Includes Isthmus of Kra south of 10°N.

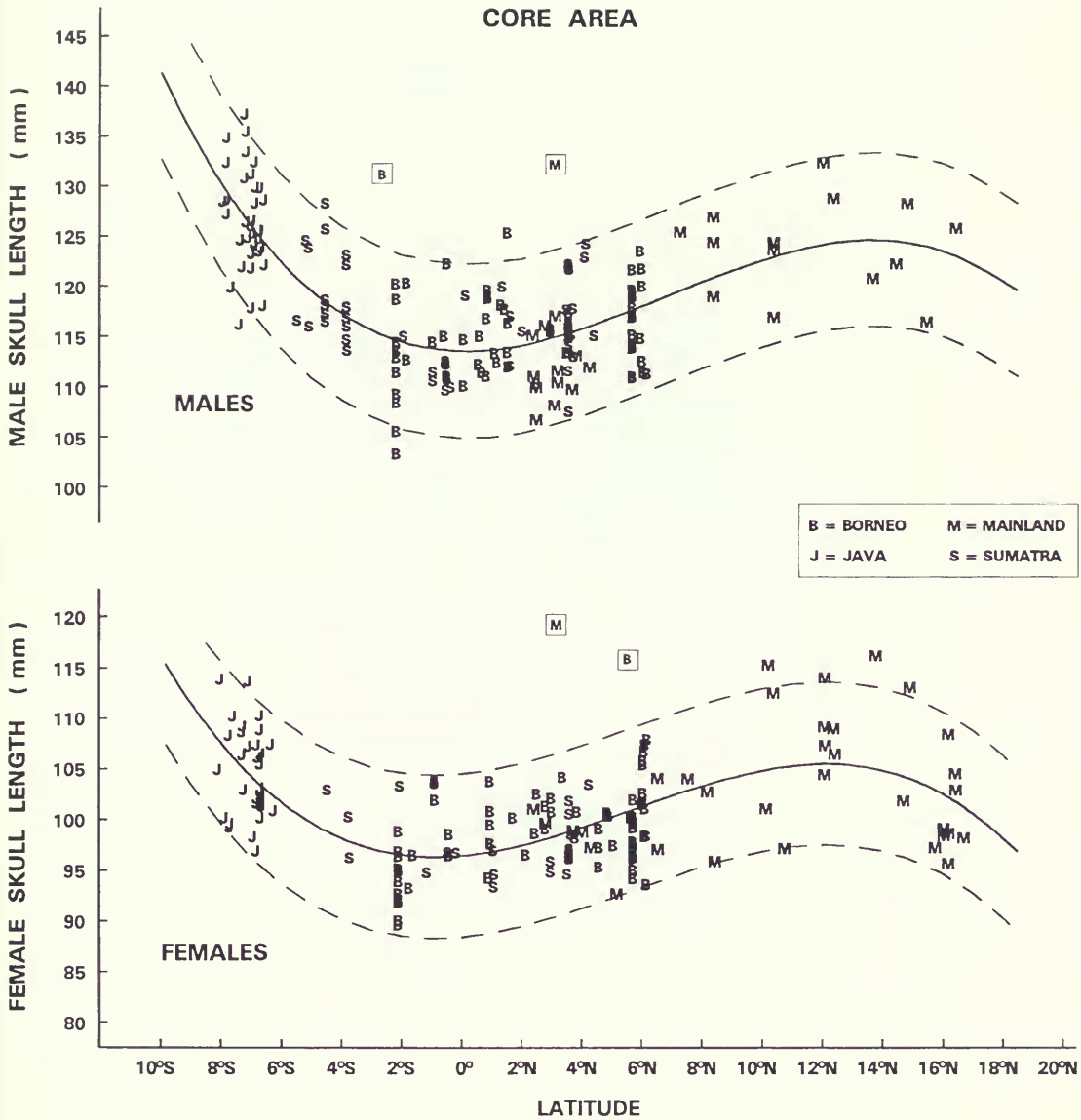

FIG. 21. Latitudinal variation of greatest length of skull in adult core-area specimens of *Macaca fascicularis* (Fooden & Albrecht, 1993, p. 526). Solid lines indicate third-order polynomial regressions of skull length on latitude for females and males; dashed lines indicate 95% confidence limits.

bin gene haplotypes varies geographically (Table 18 and below, Blood Proteins; Barnicot et al., 1966, p. 241; 1970, p. 380; D. G. Smith & Ferrell, 1980, p. 558). Judging from available evidence, the single-gene haplotype is rare, having been detected (heterozygously) in only 1 of 14 west-central Thai individuals and 1 of 20 Indonesian individuals. The double-gene haplotype is most common; it is very frequent (0.88–1.00) in Thailand north of the Isthmus of Kra; less frequent (0.52–0.62) in Thailand south of the Isthmus of Kra, in Malaysia, and in Indonesia; and, somewhat incongruously, it is very frequent (0.98) in the Philippines. The triple-gene haplotype, conversely, is relatively rare (0–0.12) in Thailand north of the Isthmus of Kra; moderately frequent (0.28–0.43) in Thailand south of the Isthmus of Kra, Malaysia, and Indonesia; and absent in the Philippines. The quadruple-gene

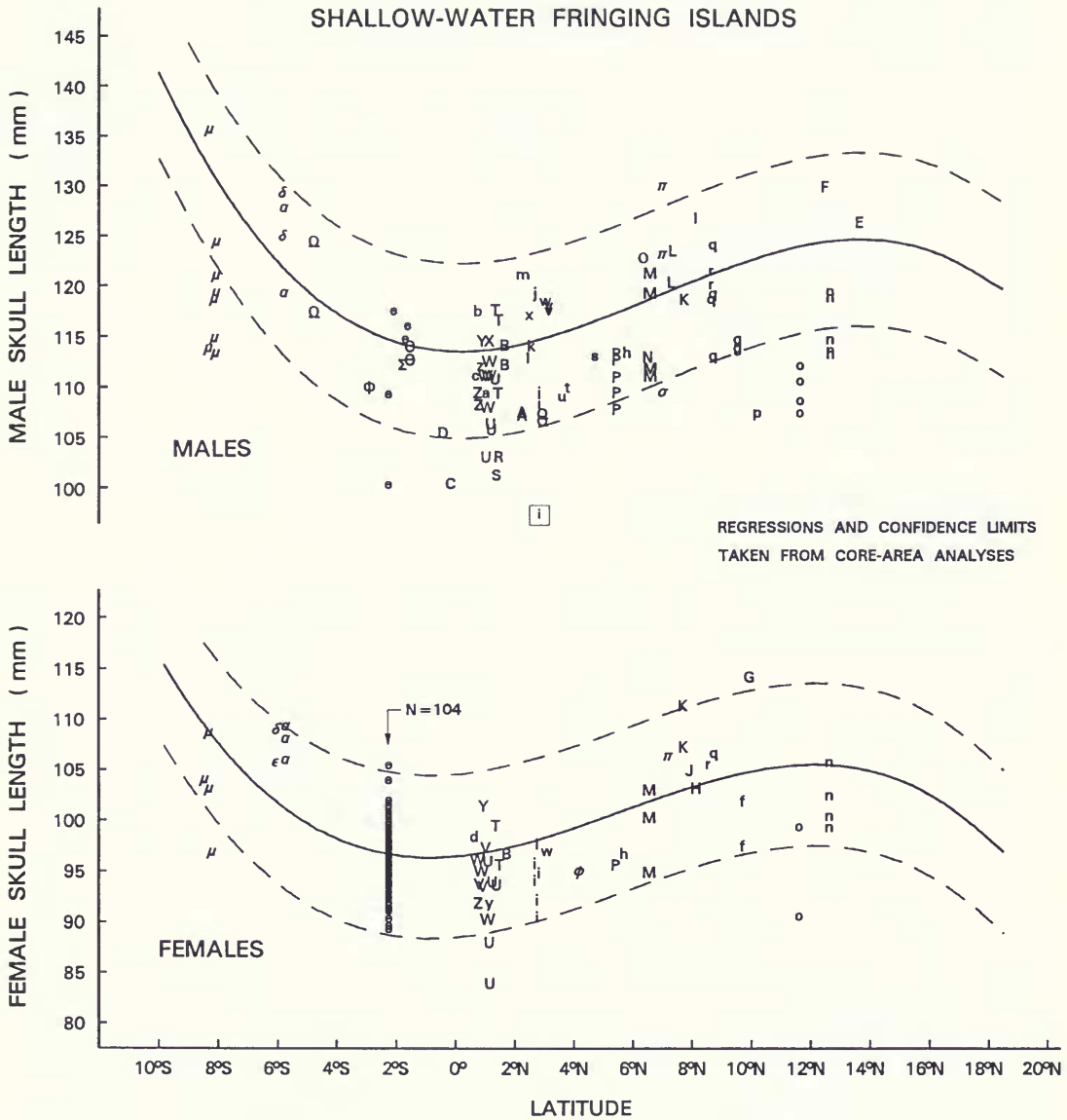

FIG. 22. Latitudinal variation of greatest length of skull in adult shallow-water fringing-island specimens of *Macaca fascicularis* compared with that in adult core-area specimens (Fooden & Albrecht, 1993, p. 528). For key to shallow-water fringing-island symbols, see Fooden and Albrecht (1993, p. 537). Solid lines indicate third-order polynomial regressions for core-area specimens; dashed lines indicate 95% confidence limits (see Fig. 21).

haplotype is relatively rare (0.02–0.08) and is restricted to Malaysia, Indonesia, and the Philippines. In *M. mulatta* and *M. fuscata,* two other members of the *fascicularis* species group (Fooden, 1991, p. 2), the frequency of alpha-globin gene haplotypes apparently is similar to that in Thailand north of the Isthmus of Kra.

HIGHLY REPEATED RESTRICTION PATTERNS—A study by Crovella et al. (1994, p. 66) of highly repeated nuclear DNA sequences has revealed that, for nine enzymes employed, restriction patterns are indistinguishable in Sumatran, Javan, and Philippine *M. fascicularis.* Eight of the nine enzymes—*Alu*I, *Bam*HI, *Eco*RI, *Hin*dIII, *Hinf* I,

TABLE 16. Summary comparison of greatest length of skull in fringing-island (FI) and core-area (CA) samples of *Macaca fascicularis*.[1] For details, see Fooden and Albrecht (1993, Tables 2, 3).

Categories of FI samples	Shallow-water FI samples			Deep-water FI samples		
	Number of islands	FI > CA[1]	CA > FI[2]	Number of islands	FI > CA[1]	CA > FI[2]
1. FI sample includes both sexes						
a. Sexes in FI sample deviate concordantly from those in CA sample	17	5	12	12	7	5
b. Sexes in FI sample deviate discordantly from those in CA sample						
1) Females, FI > CA; males, CA > FI	3	1.5	1.5	1	0.5	0.5
2) Females, CA > FI; males, FI > CA	1	0.5	0.5	2	1.0	1.0
2. FI sample includes only one sex						
a. Females	9	4	5	3	1	2
b. Males	33	12	21	11	7	4
TOTALS	63	23	40	29	16.5	12.5

[1] FI sample mean exceeds CA sample mean.
[2] CA sample mean exceeds FI sample mean.

*Hpa*I, *Pst*I, and *Pvu*II—also failed to distinguish the three geographic samples of *M. fascicularis* from Indian and Chinese samples of *M. mulatta*. One enzyme—*Xmn*I—distinguished the *M. fascicularis* samples from the *M. mulatta* samples.

Blood Proteins

The most important body of data on blood-protein allele frequencies in natural populations of *M. fascicularis* is the product of a long-term research project that has been pursued since 1979 by Dr. Y. Kawamoto and associates (Kawamoto, 1982, p. 68; Kawamoto & Ischak, 1981, p. 240; Kawamoto & Suryobroto, 1985, p. 36; Kawamoto et al., 1981, p. 20; 1982b, p. 275; 1984, p. 135; 1987, p. 98; 1988, p. 172; 1989, p. 97; 1991, p. 600; Kondo et al., 1991, p. 20; 1993, p. 171; for references to other studies of blood-protein allele frequencies in this species, see Fooden & Lanyon, 1989, p. 235). Dr. Kawamoto has generously made available an interim summary of his group's current data on *M. fascicularis,* partitioned into 11 regional or insular samples (Table 19, Appendix 10). Of the 21 polymorphic loci studied by this group, 14 exhibit relatively limited variation, with the same major allele common to all 11 samples; the 7 more variable loci are Alb, CA-II, Dia, HbA-II, IDH, Pi, and Tf (for key to abbreviations, see Table 19, footnote 1). As noted previously (cf. Fooden & Lanyon, 1989, p. 223; Kawamoto et al., 1991, p. 600), blood-protein polymorphism tends to be reduced in insular populations.

Two dendrograms (Fig. 24a) of blood-protein relationships among these 11 samples have been published by Dr. Kawamoto's group (Kawamoto et al., 1991, p. 600; Kondo et al., 1993, p. 177); one of these dendrograms includes a sample of the introduced Mauritius population of *M. fascicularis*. A consensus tree (Fig. 24b) of stable clusters common to both dendrograms delineates groupings that frequently are discordant with current and Late Pleistocene (ca. 18 Ka) land connections of the regions or islands where the respective samples were obtained (cf. Fig. 3). The most conspicuous of these discrepancies is the grouping of samples from Thailand north of the Isthmus of Kra with samples from Bali (a shallow-water island that was connected to Java during the Late Pleistocene glacial maximum) and Lombok (a deep-water island that was connected to Sumbawa during the Late Pleistocene glacial maximum).

Allele frequencies at two loci (HbA-II and Pi) tend to link the samples from Thailand north of the Isthmus of Kra with those from Bali and Lombok, and allele frequencies at one locus (Tf) tend to link the Bali and Lombok samples with each other but not with samples from Thailand north of the Isthmus of Kra (Table 19). None of the relevant HbA-II, Pi, or Tf alleles are exclusive to samples from Thailand north of the Isthmus of Kra, Bali, or Lombok. Similar allele frequencies

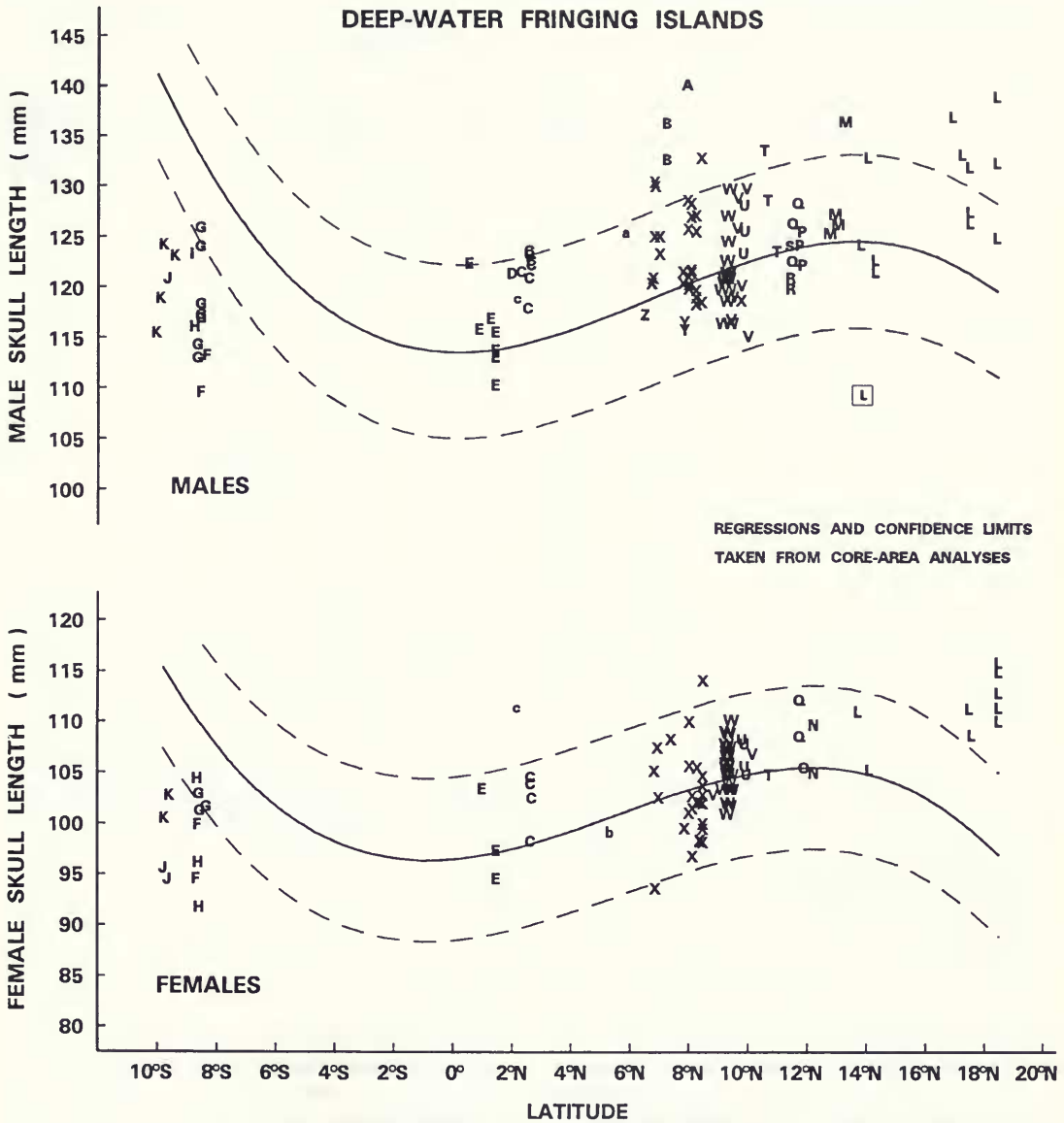

FIG. 23. Latitudinal variation of greatest length of skull in adult deep-water fringing-island specimens of *Macaca fascicularis* compared with that in adult core-area specimens (Fooden & Albrecht, 1993, p. 531). For key to deep-water fringing-island symbols, see Fooden and Albrecht (1993, p. 538). Solid lines indicate third-order polynomial regressions for core-area specimens; dashed lines indicate 95% confidence limits (cf. Fig. 21).

at these loci in samples from Thailand north of the Isthmus of Kra, Bali, and Lombok may be the result of primitive retention and/or independent convergent fluctuation of allele frequencies.

Dr. Kawamoto's group has investigated blood-protein allele frequencies in introduced populations of *M. fascicularis* in Angaur I., north of New Guinea (Kawamoto et al., 1988, p. 172), and Mauritius I., east of Madagascar (Kondo et al., 1993, p. 171). Their results indicate that the Angaur population, which apparently was introduced early in the present century, probably originated from more than a single pair of monkeys, some of which probably were imported from continental Southeast

TABLE 17. Frequency (%) of mtDNA types revealed by five restriction enzymes in six geographic samples of *Macaca fascicularis* (Harihara et al., 1988, p. 121; 1991, p. 611).[1]

mtDNA type no.	Enzyme morphs[2]					Vietnam and Cambodia (n = 5[3])	Thailand		Malaysia (n = 48)	Indonesia (n = 48)	Philippines (n = 48)
	Ba	Ec	Hi	Hp	Ss		North of Isthmus of Kra (98 > n > 65[4])	South of Isthmus of Kra (n ≤ 33[4])			
20	1	1	1	2	2	80.0	0	0	0	0	0
21	1	1	4	2	2	20.0	0	0	0	0	0
22[5]	?	?	?	?	?	0	100.0	0	0	0	0
23[5]	?	?	?	?	?	0		0	0	0	0
24[6]	?	?	?	?	?	0	0	100.0	0	0	0
6	1	1	3	1	3	0	0	0	10.4	0	0
7	1	2	1	1	2	0	0	0	10.4	0	0
15	1	1	1	1	4	0	0	0	2.1	0	0
16	3	1	1	1	2	0	0	0	2.1	0	0
17	1	1	3	1	2	0	0	0	2.1	0	0
18	1	1	5	1	2	0	0	0	2.1	0	0
19	1	1	1	3	2	0	0	0	2.1	0	0
1	1	1	1	1	2	0	0	0	60.4	6.3	0
3	1	1	1	1	3	0	0	0	8.3	37.5	0
5	1	2	2	2	1	0	0	0	0	29.2	0
8	1	2	2	1	1	0	0	0	0	8.3	0
9	1	3	1	2	1	0	0	0	0	8.3	0
10	1	1	4	1	3	0	0	0	0	2.1	0
11	1	1	1	4	3	0	0	0	0	2.1	0
12	1	3	6	2	1	0	0	0	0	2.1	0
2	1	1	1	1	1	0	0	0	0	2.1	52.1
4	1	2	1	1	1	0	0	0	0	2.1	43.8
13	1	2	1	2	1	0	0	0	0	0	2.1
14	2	2	1	1	1	0	0	0	0	0	2.1

[1] Genetic distances between non-Thai sample pairs: Indochina–Malaysia, 0.00679 ± 0.00115; Indochina–Indonesia, 0.01284 ± 0.00157; Indochina–Philippines, 0.02073 ± 0.00110; Malaysia–Indonesia, 0.00848 ± 0.00184; Malaysia–Philippines, 0.01110 ± 0.00068; Indonesia–Philippines, 0.00270 ± 0.00058 (Harihara et al., 1988, p. 124).

[2] Enzyme abbreviations: Ba = *Bam*HI; Ec = *Eco*RI; Hi = *Hin*dIII; Hp = *Hpa*I; Ss = *Sst*I.

[3] Vietnam, n = 1; Cambodia, n = 4.

[4] Cf. Kawamoto et al. (1989, p. 95) and Harihara et al. (1991, p. 611).

[5] Similar to mtDNA type nos. 1–21, particularly those in continental Southeast Asian samples (Harihara et al., 1991, p. 612).

[6] Widely distinct from mtDNA type nos. 1–23 (Harihara et al., 1991, p. 612).

Asia, Sumatra, Borneo, or Java. The Mauritius population, which apparently was introduced during the sixteenth century, probably originated from monkeys imported from Java. Computed genetic distances indicate remarkable divergence—ca. 100 times greater than expected—between allele frequencies in the Mauritius population and those in Asian populations of *M. fascicularis*; Kondo et al. (1993, p. 179) suggested that this may be the result of a genetic bottleneck (cf. Lawler et al., 1995, p. 138).

Allele frequencies at the vitamin D binding protein (DBP) locus have been studied by Tanaka et al. (1989, p. 104; 1991, p. 126) in 251 livetrapped Thai *M. fascicularis* and in 529 imported or captive-bred Malaysian, Indonesian, and Philippine *M. fascicularis* (Table 20). Based on frequencies of the three most common alleles at this locus, the sample areas may be subdivided into three groups: (1) Thailand north of the Isthmus of Kra—DBP^1 very high (0.86–1.00), DBP^2 very low (0–0.01), DBP^3 very low (0–0.01); (2) Thailand south of the Isthmus of Kra, Malaysia, and Indonesia—DBP^1 moderately high (0.48–0.57), DBP^2 low (0–0.19), DBP^3 moderately high (0.30–0.40); and (3) Philippines—DBP^1 moderately high (0.40), DBP^2 moderately high (0.59), DBP^3 absent.

Allele frequencies at the complement C6 locus have been studied by Omoto et al. (1991, p. 603) in 150 imported or captive-bred Malaysian, Indonesian, and Philippine *M. fascicularis* (Table 21). The Malaysian and Indonesian samples are

TABLE 18. Frequency of alpha-globin gene haplotypes in geographic samples of *Macaca fascicularis* compared with frequency in samples of *M. mulatta* and *M. fuscata* (O. Takenaka et al., 1989, p. 87; A. Takenaka et al., 1991, p. 324; A. Takenaka & Takenaka, 1991, p. 632).

Country	Region or island	N	Alpha-globin gene haplotypes			
			Single	Double	Triple	Quadruple
		M. fascicularis				
Thailand	North of Isthmus of Kra					
	East-central and southeast	30	0	1.00	0	0
	West-central	14	0.04	0.96	0	0
	Southwest	36	0	0.88	0.12	0
	South of Isthmus of Kra	22	0	0.61	0.39	0
Malaysia	Unknown	22	0	0.52	0.43	0.05
Indonesia	Unknown	20	0.02	0.62	0.28	0.08
Philippines	Unknown	24	0	0.98	0	0.02
		M. mulatta				
India	Unknown	13	0	0.96	0.04	0
China	Unknown	14	0	0.93	0.07	0
		M. fuscata				
Japan	Unknown	30	0.02	0.96	0.02	0

similar in allele frequencies and differ from the Philippine sample ($0.025 > P > 0.01$), particularly in their lower frequency of alleles A and M4. The Philippine sample is notably less polymorphic than the Malaysian and Indonesian samples.

In a recent study, Scheffrahn et al. (1994, p. 135) investigated variation of blood-protein allele frequencies in *M. fascicularis* in Sumatra (nine groups representing four local populations) and four nearby islands (one shallow-water, three deep-water). Based on examination of five to seven polymorphic loci, this study finds that (1) differentiation among six adjacent social groups in Sumatra is relatively great, (2) differentiation between these six adjacent groups and three other local populations in Sumatra is roughly proportional to geographic distance (25–350 km), (3) allele frequencies in a shallow-water fringing-island population in P. Tuangku (area ca. 300 km^2) are similar to those in the four local populations in Sumatra, (4) populations in the deep-water fringing islands P. Simeulue (ca. 2,000 km^2) and P. Nias (ca. 4,000 km^2), both west of Sumatra, cluster together, and (5), differentiation is greatest in P. We (ca. 250 km^2), a small deep-water fringing island north of Sumatra. Genetic drift is inferred to be the most important factor in blood-protein differentiation in insular populations. Although blood-protein allele frequencies in these *M. fascicularis* populations in Sumatra and nearby islands are variably differentiated, all of these populations share one or more alleles at each of the five to seven loci.

Blood Groups

Limited information is available concerning geographic variation of human-type blood group frequencies in *M. fascicularis* (Table 22). In a study of the A-B-O system in *M. fascicularis* saliva and serum, type B was much less frequent in Malaysian (26.1%) and Indonesian (15.8%) samples than in a Philippine sample (76.9%); in an earlier study limited to A-B-O agglutinins in serum, type B apparently was similarly less frequent in Thai and Malaysian samples than in a Philippine sample. In *M. mulatta,* a species closely related to *M. fascicularis* and parapatric with *M. fascicularis* in Thailand (Fooden, 1980, p. 5), the frequency of type B is 97.0% (n = 200; Socha & Ruffié, 1983, p. 47; cf. Nakajima et al., 1970, p. 246); contrary to expectation, this is closer to the frequency in Philippine *M. fascicularis* than to that in Thai, Malaysian, and Indonesian *M. fascicularis.* Lewis group frequencies in *M. fascicularis* are similar in Thai, Malaysian, and Philippine samples.

In a preliminary report on geographic variation of simian-type blood group H^{cy} in *M. fascicularis,* Honjo et al. (1984, pp. 73–74; cf. Terao, 1985, p. 51) indicated that the gene frequency of H^1 is moderately high in a Malaysian sample (n = 295), lower in an Indonesian sample (n = 284), and zero in a Philippine sample (n = 201). In simian-type blood group T^{cy}, the gene frequency of T^2 is represented (graphically) as lower in the Malaysian sample than in the Indonesian and Philippine samples. Nu-

TABLE 19. Blood proteins: summary of frequencies (%) of major alleles at polymorphic loci in 11 geographic samples of *Macaca fascicularis* (sample size indicated by italicized figures in parentheses). For details, see Appendix 10.

Loci[1] and alleles		Sample areas: Thailand: North of Isthmus of Kra: Central and southeast (*121*)	Thailand: North of Isthmus of Kra: Southwest (*124*)	Thailand: South of Isthmus of Kra (*33*)	West Malaysia (*140*)	Sumatra (*276*)	Java (*222*)	Bali (*136*)	Lombok (*35*)	Sumbawa (*81*)	Timor (*7*)	Philippines[2] (*142*)
Plasma proteins												
Alb	A	84	20	52	94	90	100	100	100	100	93	100
	B	16	80	48	6	8	0	0	0	0	7	0
Alp	A	100	> 99	100	100	100	100	99	100	100	100	97
ChEs	1	100	100	100	100	100	99	100	100	100	100	100
Pi	B	18	1	95	54	82	69	22	0	79	64	92
	C	82	88	5	46	18	31	78	100	21	36	8
TBPA	F	89	98	100	85	94	97	100	100	52	100	94
Tf	C3	4	24	0	4	2	10	0	0	60	57	0
	D1	2	8	62	74	62	58	< 1	3	40	43	99
	D2	32	13	0	2	0	1	0	0	0	0	0
	G2	< 1	1	5	< 1	2	14	98	83	0	0	0
Erythrocyte proteins												
Acp	A	97	99	97	96	> 99	100	100	100	100	100	100
ADA	2	100	92	100	100	100	100	100	100	100	100	99
AK	1	96	100	97	98	100	100	100	100	100	100	92
CA-I	a	99	95	100	96	98	99	100	100	100	100	100
CA-II	a	61	54	18	39	46	16	0	0	11	0	61
	b	39	46	82	61	54	84	100	100	89	100	39
CellEs	1	100	100	100	99	> 99	97	100	100	80	86	95
Dia	A	25	48	7	8	1	< 1	0	0	0	0	0
	C	72	44	93	91	99	> 99	100	100	100	100	100
EsD	1	100	100	100	> 99	100	100	100	100	100	100	94
HbA-I	1	100	100	95	99	> 99	100	100	100	100	100	100
HbA-II	0	99	100	33	38	13	69	99	97	0	0	0
	2	1	0	67	62	87	31	1	3	100	100	100
HbB	1	100	100	100	100	100	100	97	100	100	100	100
IDH	1	47	39	51	80	90	65	15	57	100	86	99
	2	53	61	49	19	9	35	85	43	0	14	1
LDHA	1	94	97	100	100	98	100	100	100	100	100	100
PGD	A	98	93	97	92	90	99	100	100	100	100	100
PHI	1	100	83	100	99	98	100	98	97	100	100	81

[1] Abbreviations: Acp = acid phosphatase, ADA = adenosine deaminase, AK = adenylate kinase, Alb = albumin, Alp = alkaline phosphatase, CA = carbonic anhydrase, CellEs = esterase, ChEs = cholinesterase, Dia = NADH-diaphorase, EsD = esterase D, HbA = hemoglobin alpha-chain, HbB = hemoglobin beta-chain, IDH = isocitrate dehydrogenase, LDHA = lactate dehydrogenase-A, PGD = 6-phosphogluconate dehydrogenase, PHI = phosphohexose isomerase, Pi = protease inhibitor, TBPA = thyroxin-binding prealbumin, Tf = transferrin.

[2] Island or islands unknown.

merical values of these gene frequencies are not reported in this publication.

Serum Cholesterol Response

The effect on serum cholesterol level of two cholesterol-containing diets—one screening diet and one test diet—was studied in samples of adult male "Malayan" (?West Malaysian) and Philippine *M. fascicularis* (Taub & Bond, 1982, p. 339, abstract only, sample sizes not specified). In response to both diets, serum cholesterol level was significantly lower in the Malayan sample (screening diet, 235 mg/dl; test diet, 370 mg/dl) than in the Philippine sample (screening diet, 353 mg/dl; test diet,

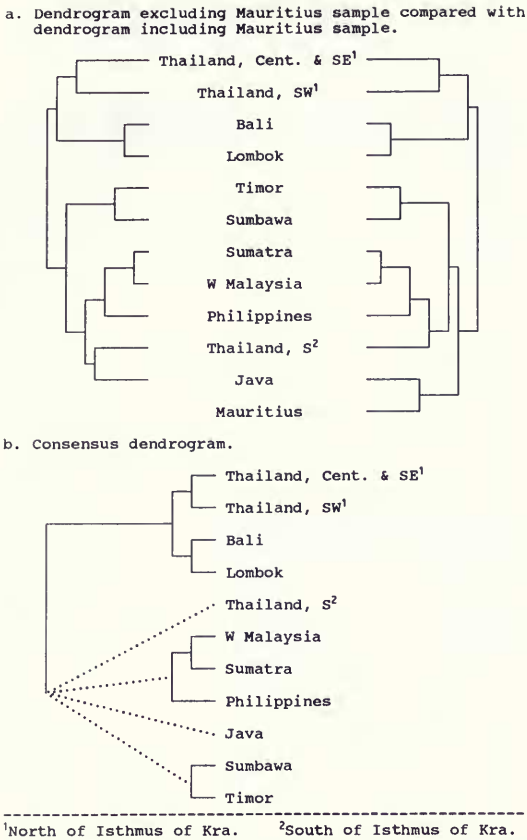

FIG. 24. Blood-protein dendrograms for geographic samples of *Macaca fascicularis*: **a.** Dendrogram that excludes Mauritius sample (Kawamoto et al., 1991, p. 600) compared with dendrogram that includes Mauritius sample (Kondo et al., 1993, p. 177). **b.** Consensus dendrogram.

487 mg/dl). In response to the screening diet, high-density lipoprotein levels were significantly higher in the Malayan sample (64 mg/dl) than in the Philippine sample (51 mg/dl), and serum lipid levels also were consistently and significantly different; in response to the test diet, serum lipid levels were less consistently different.

Karyology

Hirai et al. (1991, p. 619) studied the chromosomal G-banding pattern in 297 imported or captive-born *M. fascicularis* individuals that originated in Vietnam, Cambodia, Malaysia, Indonesia, and the Philippines; the sample size for each country is not specified. No significant differences in banding pattern were detected among samples from these five countries, although one female from Vietnam exhibited possible interstitial heterochromatin in one autosome. The chromosome number of *M. fascicularis* was confirmed to be 42.

Diseases

Malaria

Of the seven species of malaria (*Plasmodium*) that have been recorded as natural parasites in macaques, five species naturally infect *M. fascicularis* (Fooden, 1994, p. 576). Of these, *P. inui* is quartan (72-hr asexual erythrocytic cycle); *P. cynomolgi, P. fieldi,* and *P. coatneyi* are tertian (48-hr cycle); and *P. knowlesi* is quotidian (24-hr cycle). Natural infections with all five of these species have been recorded in West Malaysia, which apparently is the center of malaria infection in *M. fascicularis* (Table 23). For *P. fieldi,* natural infections are known only in West Malaysia. For *P. coatneyi,* infections also have been reported in the southern Philippine islands of Palawan (questionable) and Cebu. For *P. knowlesi,* infections have

TABLE 20. Summary of allele frequencies at the DBP locus in geographic samples of *Macaca fascicularis* (Tanaka et al., 1989, p. 106; 1991, p. 131).

Country	Region or island	N	Alleles					
			DBP[1]	DBP[2]	DBP[3]	DBP[6]	DBP[16]	Other
Thailand	North of Isthmus of Kra							
	East-central and southeast	46	1.000	0	0	0	0	0
	West-central	57	0.860	0	0	0	0.140	0
	Southwest	118	0.970	0.013	0.013	0	0.004	0
	South of Isthmus of Kra	30	0.567	0	0.400	0.033	0	0
Malaysia	Unknown	204	0.476	0.130	0.380	0.007	0	0.007
Indonesia	Unknown	167	0.491	0.192	0.305	0.003	0	0.009
Philippines	Unknown	158	0.405	0.592	0	0	0	0.003

TABLE 21. Allele frequencies at the complement C6 locus in three imprecisely localized geographic samples of *Macaca fascicularis* (Omoto et al., 1991, p. 604).

Country	N	Alleles									Hetero-zygosity
		A	A1	A2	B	B1	M2	M3	M4	Other[1]	
Malaysia	50	0.48	0.03	0.06	0.06	0.06	0.08	0.14	0.03	0.06	0.7298
Indonesia	50	0.43	0.05	0.01	0.08	0.02	0.08	0.18	0.05	0.10	0.7622
Philippines	50	0.66	0	0	0	0	0.10	0.09	0.14	0.01	0.5266
TOTAL	150	0.52	0.03	0.02	0.05	0.03	0.09	0.14	0.07	0.05	—

[1] Seven minor alleles.

been reported in Tioman, Java (questionable), Palawan, and Cebu. For *P. cynomolgi,* infections have been reported from Cambodia in the north to Java in the south and from the Nicobar Islands in the west to Cebu in the east. Similarly, for *P. inui,* infections have been reported from Thailand in the north to Java in the south and from the Nicobar Islands in the west to Mindanao in the east. Negative screening results suggest that malaria infections may be absent in *M. fascicularis* populations that inhabit Luzon (n = 24) and Bali (n = 60). In malarious areas, the mean incidence of natural malaria infections in *M. fascicularis* is about 0.18 (n > 2,300); individual monkeys often are simultaneously infected with two or more species of malaria. Natural malaria infections in *M. fascicularis* and other macaques are relatively benign.

The known vectors of malaria infections in *M. fascicularis* are five species of mosquitoes that belong to the Leucosphyrus Group of the genus *Anopheles* (Table 24); geographic ranges of these five species of mosquitoes are partly overlapping (cf. Fooden, 1994, p. 581). One of these species, *A. hackeri,* is a proved vector of all five species of malaria that infect *M. fascicularis.* Individual mosquitoes sometimes harbor two or more species of malaria simultaneously.

Although natural malaria infections in *M. fascicularis* are benign, untreated experimental infections with one species of malaria, *P. knowlesi,* are

TABLE 22. Geographic variation of A-B-O and Lewis blood group phenotype frequencies in *Macaca fascicularis.*

Country	Region or island	Sample size and frequency (%)				
		A-B-O groups (saliva, serum)[1]				
		N	A	B	AB	O
Malaysia	Unknown	245	45.4	26.1	26.9	1.6
Indonesia	Unknown	165	55.1	15.8	27.9	1.2
Philippines	Unknown	130	2.3	76.9	19.2	1.6
		A-B-O agglutinins (serum)[2]				
		N	Anti-A	Anti-B	Anti-A + B	None
Thailand	Southwest (north of Isthmus of Kra)	146	26.7	26.0	35.0	12.3
Malaysia	West Malaysia	232	24.6	32.3	30.2	12.9
Philippines	Mindanao	60	88.3	5.0	5.0	1.7
		Lewis groups (erythrocytes)[2,3]				
		N	Le^a-positive	N	Le^b-positive	
Thailand	Southwest (north of Isthmus of Kra)	149	4.0	86	4.6	
Malaysia	West Malaysia	231	4.8	181	10.5	
Philippines	Mindanao	60	3.3	60	8.3	

[1] Reference: Terao et al., 1981, p. 76 (cf. Honjo et al., 1984, p. 73).
[2] References: Nakajima et al., 1970, pp. 246, 248; Omoto et al., 1970, p. 217.
[3] Tested by direct agglutination with human anti-Le^a serum and rabbit anti-Le^b serum.

TABLE 23. Geographic distribution of malaria species identified as natural parasites in *Macaca fascicularis* samples. For details, see Fooden (1994, p. 576).

Geographic origin of *M. fascicularis* sample	Malaria species (*Plasmodium*)					
	inui	*cynomolgi*	*fieldi*	*coatneyi*	*knowlesi*	sp.
Thailand	×					
Cambodia		×				
West Malaysia	×	×	×	×	×	
Tioman	×				×	
Nicobar Islands	×	×				
Sumatra						×
Java	×	×			?	
Borneo		?				
Palawan	×	×		?	×	
Cebu	×	×		×	×	
Mindanao	×					

almost invariably fatal in samples of *M. fascicularis* from the Indochinese Peninsula and possibly from the northern part of the Isthmus of Kra, both outside of the natural range of *P. knowlesi* (Fooden, 1994, p. 585); in continental Southeast Asia, *P. knowlesi* is not known to occur north of West Malaysia. Conversely, untreated experimental infections with *P. knowlesi* are relatively benign in samples of *M. fascicularis* from Cebu, which is within the natural range of this species of malaria. This suggests that populations of *M. fascicularis* that inhabit areas within the natural range of *P. knowlesi* have evolved partial resistance to the deleterious effects of this parasite.

Simian T-Lymphotrophic Retrovirus, Type 1

Samples of *M. fascicularis* populations in several areas have been tested for antibodies to reveal infections with simian T-lymphotrophic retrovirus, type 1 (STLV-1) (Table 25). Infections with STLV-1 are relatively frequent in *M. fascicularis* in Indonesia, particularly in P. Sumbawa (Lesser Sunda Islands, between P. Lombok and P. Flores), and rare or absent in other natural populations sampled. STLV-1 infections also are fairly frequent in the introduced population of *M. fascicularis* in Mauritius.

Susceptibility to Attenuated Polio Virus

A retrospective analysis of the frequency of spinal cord lesions induced by inoculation with various dilutions of two types of polio vaccines indicates that *M. fascicularis* captives imported from the Philippines were up to 1,000 times more susceptible to induction of lesions than *M. fascicularis* captives imported from Indonesia, Malaysia, and the Indochinese Peninsula (Chino et al., 1992, p. 11).

Natural History

Habitats

Although *M. fascicularis* is most commonly encountered at low elevations, its known altitudinal range in the core area of its distribution extends to at least 1200 m in West Malaysia (Gunong Benom; possibly to 1500 m in Cameron Highlands), to 2000 m in Sumatra (Bur ni Bebuli), to 1800 m in Borneo (Lumu Lumu), and to 2000 m in Java (Gunung Salak); in the northern part of the core area (altitudinal data available for Bangladesh, Vietnam, Cambodia, and Thailand), this species has not been recorded above 400 m (Lac Giao, Viet-

TABLE 24. Known vectors of malaria species that have been identified as natural parasites in *Macaca fascicularis*. For details, see Fooden (1994, p. 581).

Vector species (*Anopheles*)	Malaria species (*Plasmodium*)				
	inui	*cyno-molgi*	*fieldi*	*coat-neyi*	*know-lesi*
balabacensis	?	?		?	?
dirus, sensu lato	×	×			
hackeri	×	×	×	×	×
introlatus		×	×		
leucosphyrus, sensu lato	×				

TABLE 25. Simian T-lymphotrophic retrovirus, type 1: frequency of *Macaca fascicularis* individuals or groups positive for antibodies.

Origin	Data for individuals			Data for groups			Reference
	N	Individuals positive	%	N	Groups positive	%	
Blood samples obtained from monkeys in country of origin							
Thailand, north of Isthmus of Kra	220	0	0	7	0	0	*1*
Thailand, south of Isthmus of Kra	30	0	0	2	0	0	*1*
Thailand	117	4	3.4	—	—	—	*2*
West Malaysia	199	0	0	—	—	—	*2*
Indonesia	245	34	13.9	23	8	34.8	*3*
Sumatra	—	—	—	4	1	25.0	
Java	—	—	—	7	2	28.6	
Bali	—	—	0	4	0	0	
Lombok	—	—	0	3	0	0	
Sumbawa	—	—	ca. 50	5	5	100.0	
Blood samples obtained from imported laboratory monkeys							
Malaysia	113	4	3.5	—	—	—	*4*
Indonesia	103	20	19.4	—	—	—	*4*
Philippines	83	0	0	—	—	—	*4*
Blood samples obtained from introduced population							
Mauritius	102	15	14.7	6	—	—	*5*

[1] Key to references: *1,* Ishida & Varavudhi, 1992, p. 164. *2,* Ishida et al., 1985, pp. 840–842. *3,* Hayami et al., 1983, p. 620. *4,* Hayami et al., 1984, p. 181. *5,* Matsubayashi et al., 1992, p. 284.

nam). In shallow-water fringing islands, the altitudinal range extends to 900 m in P. Tioman (Sedagong) and 1200 m in Bali (Gunung Bratan). In deep-water fringing islands, where *M. fascicularis* often is the only native monkey, the altitudinal range extends to 1700 m in Lombok (Gunung Rinjani), 2100 m in Timor (Gunung Mutis), 1950 m in Mindanao (Mt. McKinley), 1800 m in Negros (Canlaon Volcano), 1900 m in Mindoro (Mt. Halcon), and 2300 m in Luzon (Mt. Data).

At low elevations, the preferred habitats of *M. fascicularis* apparently are seashore, riverbanks, and swamp forest (Table 26). Along the seashore, mangrove forest is reported as a frequent habitat of this species from Bangladesh in the north (M. A. R. Khan & Wahab, 1983, p. 102) to Flores in the south (Auffenberg, 1981, p. 242): the only other species of monkeys that regularly inhabit mangrove forest in Southeast Asia are two colobines, *Trachypithecus cristatus* and *Nasalis larvatus. Macaca fascicularis* also has been reported inland in lowland secondary and primary forest and, less frequently, in upland secondary and primary forest. At nearly 2000 m in northern Sumatra, Volz (1912, p. 88) reported, "To my astonishment, up here in this cool damp high-altitude vegetation, I still observed several monkeys, namely *Macacus cynomolgus* [= *M. fascicularis*]" (translated from German). This species also inhabits heavily disturbed areas, including the immediate vicinity of villages and farms; following logging, the density of *M. fascicularis* sometimes increases (Johns, 1992, p. 438).

Arboreality/Terrestriality

On the seacoast and riverbanks, *M. fascicularis* often forages on the ground (25% of encounters in Sumatra [Crockett & Wilson, 1980, p. 165], 26.5% of encounters in Kalimantan [Fittinghoff & Lindburg, 1980, p. 189]). In inland forests, *M. fascicularis* is predominantly arboreal (98% in West Malaysia [Bernstein, 1967, p. 204; Aldrich-Blake, 1980, p. 158], ca. 97% in Kalimantan [Wheatley, 1980, p. 216]). This species apparently favors the lower and middle forest strata; in more than 50% of forest sightings, troops were in branches less than 20 m above the forest floor (West Malaysia [Aldrich-Blake, 1980, p. 159; cf. Harrison, 1961, p. 14], Sumatra [Rijksen, 1978, p. 127], Kalimantan [Rodman, 1978, p. 476]). Observations in Sumatra indicate that smaller groups of *M. fascicularis* tend to occur higher in the canopy (van

Schaik et al., 1983b, p. 216; D. R. Vos et al., 1992, p. 388). In response to danger, troops may flee either on the ground (Burma [Tickell, 1854–1875, p. [17], Great Nicobar I. [Das & Ghosal, 1977, p. 265], Sumatra [Volz, 1912, p. 369; Ulmer in Miller, 1942, p. 127], Lesser Sunda Islands [B. Rensch, 1930, p. [17]; Mertens, 1936, p. 320]), in the canopy (Thailand [Fooden, [1975], p. 100], West Malaysian [Bernstein, 1967, p. 204], P. Simeulue [Sugardjito et al., 1989, p. 200], Sumatra [Crockett & Wilson, 1980, p. 165], Kalimantan [Kurland, 1973, p. 250; Wheatley, 1980, p. 216]), or partly on the ground and partly in the canopy (Thailand [Fooden, [1975], p. 100]). Accidental falls of this species out of trees have been observed in northern Sumatra (Karssemeijer et al., 1990, p. 286). Details of locomotor behavior are discussed by Kurland (1973, p. 250), Fleagle (1980, p. 198), Cant (1988, p. 31), and Cannon and Leighton (1994, p. 512). At night, *M. fascicularis* usually sleeps in tall, relatively bare trees near a river (Singapore [Ridley, 1906, p. 142], Sumatra [Moszkowski, 1909, p. 24], Sarawak [Hornaday, 1910, p. 358], and numerous later accounts, particularly Fittinghoff & Lindburg, 1980, p. 190—Kalimantan).

Swimming

Observers agree that *M. fascicularis* frequently enters bodies of water, apparently often for pleasure, and that it is an excellent swimmer. In Burma, a wounded male that was attempting to escape from humans swam about 50 m underwater (Tickell, 1854–1875, p. [18]). In a captive insular group of *M. fascicularis* in Japan, a young male that was defeated in a dominance fight apparently swam 100 m to a breakwater (Furuya, 1965, p. 325). However, during the course of 3 years in the same captive insular group, most of about 60 individuals that were driven away by dominant group members died by drowning; none apparently reached the next nearest island, which is about 250 m distant and which may not have been visible to the escaping monkeys. Drownings also have been reported in natural populations in coastal Thailand (Aggimarangsee, 1992, p. 130).

Troop Size and Composition

Mean size of nonprovisioned troops of *M. fascicularis* generally varies from about 12 to 25 (Table 27). Mean troop size is exceptionally small (ca. 5) in a highly disturbed area in Vietnam and exceptionally large in western Java (ca. 47, n = 5 troops) and Mauritius (77.5, n = 2 troops, introduced population). Crockett and Wilson (1980, p. 149) suggested that troop size in Sumatra may be smallest in mangrove forest, larger in inland primary forest, and largest in inland secondary forest (cf. Ruiter, 1993, pp. 90–91), but the observed differences are acknowledged not to be statistically significant. In provisioned troops in Thailand, troop size (mean = 76.9, n = 33 troops) generally exceeds that in nonprovisioned troops (Aggimarangsee, 1992, p. 150). Solitary males, not associated with any troop, have been reported in Thailand (Fooden, 1971, p. 24), Singapore (Furuya, 1965, p. 294), Sumatra (Wilson & Wilson, 1973, p. 5; Rijksen, 1978, p. 111; Norikoshi, 1984, p. 5), Sabah (Kurland, 1973, p. 253), Java (Hoogerwerf, 1970, p. 408), and Mindanao (Hoogstraal, 1951, p. 45). In sample areas studied, the pooled ratio of sexually mature males to sexually mature females varies from 0.22 to 0.90 (Table 28); within troops, known sex ratios vary from 0.14 to 1.67.

During a 10-year period of investigation at Kuala Lompat, West Malaysia, the size of local troops tended to remain relatively constant (Chivers & Raemaekers, 1980, p. 251). However, troops often temporarily subdivide into smaller units while foraging (West Malaysia [Aldrich-Blake, 1980, p. 147], Sumatra [van Schaik et al., 1983b, p. 214], Kalimantan [Kurland, 1973, p. 253; Rodman, 1978, p. 470; Wheatley, 1978, p. 348]). At each of two localities in Sumatra, a large troop has been observed to permanently subdivide into two unequal-sized daughter troops (van Schaik et al., 1983a, p. 174; Norikoshi, 1984, p. 6).

Home Range, Day Range

Reported home-range area in nonprovisioned troops varies from 12.5 ha in P. Simeulue to more than 300 ha in West Malaysia (Table 29). Overlap between home ranges of adjacent troops generally is slight, but the home range of a daughter troop may overlap extensively with that of the troop from which it split (van Schaik & van Noordwijk, 1988, p. 80), and home ranges of troops in some small islands also may overlap extensively (Angst, 1973, p. 625). Although home ranges of some adjacent troops are separated by rivers (van Noordwijk & van Schaik, 1985, p. 850), the home ranges of a pair of adjacent troops in Borneo overlapped on both sides of a river (Fittinghoff & Lindburg, 1980, p. 207).

TABLE 26. Recorded habitats of *Macaca fascicularis*.

Sample area	Mangrove	Other coastal	Riverine	Lowland forest: Secondary	Lowland forest: Primary	Upland[1] forest: Secondary	Upland[1] forest: Primary	Cultivated area	Populated area; temple	Reference[2]
Core area										
Bangladesh	×									*1*
Burma	×	×	×	×						*2*
Thailand, > 10°N	×	×	×	×	×			×	×	*3*
Vietnam		×		×						*4*
Thailand, < 10°N	×		×	×	×			×	×	*5*
West Malaysia	×	×	×	×	×		×	×	×	*6*
Sumatra	×	×	×	×	×	×	×	×	×	*7*
Borneo	×	×	×	×	×		×	×	×	*8*
Java		×	×	×		×				*9*
Shallow-water fringing islands										
Mergui Archipelago		×								*10*
Con Son		×		×						*11*
Tioman		×		×	×			×		*12*
Singapore	×		×	×	×				×	*13*
Riau-Lingga Archipelago[3]	×				×			×		*14*
Kepulauan Natuna[4]		×								*15*
Banggi group[5]	×				×					*16*
Bali		×			×			×	×	*17*
Deep-water fringing islands										
Nicobar Islands[6]		×	×		×				×	*18*
Simeulue	×		×		×					*19*
Nias					×					*20*
Lesser Sundas[7]	×	×	×	×	×		×	×	×	*21*
Philippines		×	×	×	×		×	×		*22*

[1] Altitude > 500 m.

[2] Key to references: *1,* M. A. R. Khan & Wahab, 1983, p. 102. *2,* Helfer, 1838, p. 858; Phayre in Blyth, 1844, p. 475; Mason, 1851, p. 220; Tickell, 1854–1875, p. [17]; Shortridge in Wroughton, 1915, p. 700, *3,* Gairdner, 1914, p. 28; Kloss, 1916b, p. 32; Gyldenstolpe, 1917b, p. 6; Fooden, 1971, p. 15; Lekagul & McNeely, 1977, p. 293; Eudey, 1980, p. 75; Aggimarangsee, 1992, p. 119. *4,* Van Peenen et al., 1971, p. 134; Lippold, 1977, p. 521. *5,* Robinson in Bonhote, 1903, p. 4; Fooden, [1975], p. 100; Boonratana, 1988, pp. 73 ff.; Aggimarangsee, 1992, p. 137; Eudey, 1994, p. 273. *6,* Kelsall, 1894b, p. 16; Flower, 1900, p. 316; Shebbeare, 1940, p. 57; Tweedie & Harrison, 1954, p. 16; Furuya, 1965, p. 287; Bernstein, 1967, p. 198; Harrison, 1969, p. 176; Medway, 1972b, p. 120; Southwick & Cadigan, 1972, p. 8; Chivers & Davies, 1979, pp. 19–20; Lim & Sasekumar, 1979, p. 106; J. R. MacKinnon & MacKinnon, 1980, pp. 176, 186; Mah & Aldrich-Blake, 1980, p. 354; J. R. Marsh & Wilson, 1981, p. 232; Johns, 1986b, p. 207. *7,* Snelleman, 1887, p. 10; Hagen, 1890, p. 80; Miller, 1902a, p. 158; Schneider, 1905, p. 72; Moszkowski, 1909, p. 24; Volz, 1912, p. 88; H. C. Robinson & Kloss,1918, p. 6; F. A. Ulmer, Jr., in Miller, 1942, p. 129; Wilson & Wilson, 1973, p. 5; Rijksen, 1978, p. 111; van Schaik & van Noordwijk, 1985a, p. 141; Ghiglieri, 1986, p. 108; Bismark, 1992, p. 13; Yanuar & Sugardjito, 1993, p. 34. *8,* Wallace, 1869, pp. 82, 326; Hose, 1893, p. 8; J. Büttikofer in Jentink, 1897, p. 39; Hornaday, 1910, p. 358; Shelford, 1916, p. 10; Mjöberg, 1930, p. 25; Allen & Coolidge, 1940, p. 147; Burgess, 1961, p. 146; Davis, 1962, p. 57; Yoshiba, 1964, p. 25; Kawabe & Mano, 1972, p. 216; Kurland, 1973, p. 247; Banks, 1978, pp. 166 ff.; Mittermeier, 1980, p. 252; Joines, 1981, p. 9; Chivers & Burton, [1991], p. 140; Rodman, 1991, p. 364; Cannon & Leighton, 1994, p. 509, *9,* J. J. Menden, 3 Jan.–8 Apr. 1933, AMNH 101811, 102015, 102017–102022 (Linggajati; Ciremay); Hoogerwerf, 1970, p. 408; Bismark, 1992, p. 13. *10,* Carpenter, 1887, p. 53. *11,* Van Peenen et al., 1970, p. 421. *12,* Medway, 1966, p. 16; D. W. Lee, 1977, p. 21. *13,* Ridley, 1895, p. 24; Chasen, 1924a, p. 78 (cf. ZRC 4-089); Chuang, 1973, p. 3; Lucas & Corlett, 1991, p. 203. *14,* W. L. Abbott, 23 Jul. 1899, USNM 101603 (P. Lingga); Abbott in Miller, 1906c, p. 281. *15,* A. Everett in Thomas & Hartert, 1894, p. 654. *16,* Shukor Md. Nor, pers. comm., 11–20 Jul. 1991. *17,* Anonymous, 1931, p. 457; Angst, 1975, p. 372; Wheatley, 1988, p. 517; Wheatley & Harya Putra, 1994, p. 247. *18,* W. L. Abbott, 25–27 Feb., 23 Mar. 1901, USNM 111795–111797, 111799 (field catalog); Kloss, 1903a, pp. 114, 150; Abdulali, 1967, p. 143; Kalra, 1980, p. 50; Das & Ghosal, 1977, p. 265. *19,* W. L. Abbott, 18 Nov. 1901, USNM 114162 (field catalog); van Schaik & van Noordwijk, 1985a, p. 140; Sugardjito et al., 1989, p. 201. *20,* F. A. Ulmer, Jr., in Miller, 1942, p. 129. *21,* Mertens, 1936, pp. 318–320; Pfeffer, 1959, p. 198; Auffenberg, 1981, p. 242; Kitchener et al., 1990, p. 98. *22,* Cf. Fooden, 1991, p. 20.

[3] Information available for P. Sugi and P. Lingga.

[4] Information available for P. Serasan and P. Natuna Besar.

TABLE 27. Recorded size of nonprovisioned troops of *Macaca fascicularis*.

Sample area	Troop size			Number of troops	Reference[1]
	Mean	Minimum	Maximum		
Core area					
Bangladesh	16.0	9	29	6	*1*
Burma	ca. 15	5	20	?	*2*
Thailand	ca. 25	< 10	ca. 100	16	*3*
Vietnam	ca. 5	3	ca. 10	?	*4*
West Malaysia	ca. 25	14	ca. 70	> 8	*5*
Sumatra	ca. 20	6	ca. 65	63	*6*
Borneo	< 20	< 10	30	> 33	*7*
Java	ca. 47	39	58	5	*8*
Deep-water fringing islands					
Little Nicobar I.	ca. 25	ca. 20	ca. 30	?	*9*
Great Nicobar I.	ca. 18	6	30	6	*10*
Simeulue	12.5	10	15	10	*11*
Nias	ca. 12	?	?	?	*12*
Flores	15	8	32	4	*13*
Philippines	ca. 18	ca. 5	ca. 50	≥ 7	*14*
Introduced populations					
Mauritius	77.5	66	89	2	*15*
Angaur	ca. 15	ca. 10	ca. 20	?	*16*

[1] Key to references: *1,* M. A. R. Khan & Wahab, 1983, p. 104. *2,* Tickell, 1854–1875, p. [17]; Yin, 1967, p. 9. *3,* Fooden, 1971, pp. 15, 25; [1975], p. 100; Lekagul & McNeely, 1977, p. 293; Eudey, 1980, pp. 75–76. *4,* Van Peenen et al., 1971, p. 134; Lippold, 1977, p. 521. *5,* Furuya, 1965, p. 291; Bernstein, 1967, p. 199; Aldrich-Blake, 1980, p. 149; J. R. MacKinnon & MacKinnon, 1980, p. 168; Johns, 1986a, p. 685; cf. Flower, 1900, p. 316. *6,* Snelleman, 1887, p. 10; F. Kurt & W. Sinaga in Angst, 1975, p. 332; Crockett & Wilson, 1980, p. 157; van Schaik & van Noordwijk, 1986, p. 297; Ruiter, 1993, p. 90. *7,* Davis, 1962, p. 58; Yoshiba, 1964, p. 25; Kurland, 1973, p. 251; Macdonald, 1982, pp. 63, 71; Chivers & Burton, [1991], p. 141; A. Suzuki, 1991, p. 53. *8,* Hoogerwerf, 1970, p. 408; Angst, 1975, p. 337. W. L. Abbott, 27 Feb. 1901, USNM 111797 (field tag). *10,* Das & Ghosal, 1977, p. 266. *11,* van Schaik & van Noordwijk, 1985a, p. 142. *12,* F. A. Ulmer, Jr., in Miller, 1942, p. 129. *13,* Auffenberg, 1981, p. 242. *14,* Fooden, 1991, p. 18. *15,* Sussman & Tattersall, 1986, p. 36. *16,* Matsubayashi et al., 1987, p. 84.

Reported mean day-range length varies from 325 m to 1,900 m (Table 29). In Sumatra, day-range length is positively correlated with troop size (van Schaik et al., 1983a, p. 176). Following a severe forest fire in Kalimantan, the mean day-range length in one troop declined from about 1,450 m to 1,300 m (Berenstain, 1986, p. 260).

Density

In a broad survey of *M. fascicularis* in Sumatra conducted in 1971–1973, reported density varied from 0.60 troops/km² (11.2 individuals/km²) in hill scrub-grassland to 7.71 troops/km² (143.4 individuals/km²) in *Rhizophora* mangrove swamp (Crockett & Wilson, 1980, p. 160); overall mean density was 2.98 troops/km² (55 individuals/km²) in 111.45 km² surveyed. Roughly similar densities have been recorded in Bangladesh (M. A. R. Khan & Wahab, 1983, p. 104), West Malaysia (Chivers & Davies, 1979, p. 17; J. R. MacKinnon & MacKinnon, 1980, p. 168; Marsh & Wilson, 1981, p. 232; cf. Southwick & Cadigan, 1972, p. 8), Sumatra (J. R. MacKinnon, 1973, p. 240; Rijksen, 1978, p. 122; van Schaik & van Noordwijk, 1985a, p. 142; Bismark, 1992, p. 14; Yanuar & Sugardjito, 1993, p. 35), Kalimantan (Kurland, 1973, p. 251; Wilson & Wilson, 1975, p. 254; Wheatley, 1982, p. 205; cf. Rodman, 1978, p. 472; A. Suzuki, 1991, p. 53), and Java (Bismark, 1992, p. 14). Investigators who have studied the density of this species in primary and secondary forest

←

[5] Information available for P. Balambangan, P. Banggi, P. Malawali, and P. Maliangin Besar.
[6] Information available for Katchall I., Little Nicobar I., and Great Nicobar I.
[7] Information available for P. Lombok, P. Sumbawa, P. Rintja, and P. Flores.

TABLE 28. Ratio of sexually mature males to sexually mature females reported in nonprovisioned troops of *Macaca fascicularis*.

Sample area	Number of troops	Number of sexually mature individuals	Troop sex ratios		Pooled sex ratio	Reference[1]
			Minimum	Maximum		
Bangladesh	6	55	0.17	0.25	0.22	*1*
Burma	?	?	0.20	0.25	0.22	*2*
West Malaysia	1	13	—	—	0.62	*3*
Sumatra	7	116	0.69	1.67	0.90	*4*
Borneo	6	44	0.44	1.00	0.57	*5*
Java	4	99	0.62	1.00	0.83	*6*
Simeulue	10	85	0.14	1.00	0.55	*7*

[1] Key to references: *1*, M. A. R. Khan & Wahab, 1983, p. 104. *2*, Tickell, 1854–1875, p. [17]. *3*, Aldrich-Blake, 1980, p. 149. *4*, van Noordwijk & van Schaik, 1985, p. 850; Ruiter, 1993, pp. 98, 99. *5*, Kurland, 1973, p. 251; Macdonald, 1982, p. 63; Cannon & Leighton, 1994, p. 509. *6*, Angst, 1975, p. 337. *7*, Sugardjito et al., 1989, p. 202.

agree that the density is greater—by a factor of 1.3–9.8—in secondary forest. In P. Simeulue, a deep-water island west of Sumatra, density (> 100 individuals/km^2) reportedly is about twice that in comparable habitats in Sumatra (van Schaik & van Noordwijk, 1985a, p. 142). Density reportedly also is high (> 400 individuals/km^2) in P. Peutjang, a small shallow-water island off the western tip of Java (Angst, 1975, p. 329). In provisioned troops at Ubud, Bali, density is about 1,600 individuals/km^2 (Wheatley, 1989, p. 65).

Based on rough estimates of population density and remaining available habitat, K. S. MacKinnon (1986, p. 111) calculated provisionally that the population of *M. fascicularis* in Indonesia at that time was 3,726,860, and J. R. MacKinnon and MacKinnon (1987, p. 189) calculated that the population in mainland Southeast Asia north of West Malaysia was 309,360. If these provisional calculations are reasonable, the total population of this species about 10 years ago in its entire natural range—which, in addition to Indonesia and mainland Southeast Asia north of West Malaysia, includes the Nicobar Islands, Malaysia, Brunei, and the Philippines–may have been approximately 5 million.

Diet

Fruits, of at least 185 species (Lucas & Corlett, 1991, p. 205; 1992, p. 45; cf. Ungar, 1994, p. 217; 1995, p. 232), apparently are the main food of *M. fascicularis* (Table 30). Ingestion of fruit frequently (ca. 57% of observations) involves use of the incisors (Ungar, 1994, p. 210). When *M. fascicularis* feeds on fruit, seeds that are more than about 4 mm wide are separated from the surrounding pulp and rejected, either manually or by spitting, whereas smaller seeds usually are swallowed and defecated intact (Corlett & Lucas, 1990, p. 167).

Macaca fascicularis also consumes leaves and other plant parts, invertebrates, and small vertebrates. Widely reported invertebrate prey includes crustaceans, bivalves, and snails, along the seacoast and riverbanks, and insects inland. Oysters sometimes are broken open by smashing with a stone that a monkey may transport up to 75 m for this purpose (Carpenter, 1887, p. 53). The capture and consumption of an adult sparrow by a captive *M. fascicularis* in the Calcutta Zoo is described by Mandal (1990, p. 435).

This species often raids cultivated crops (Kloss, 1903a, p. 128; Miller, 1903a, p. 438; Das & Ghosal, 1977, p. 266; Wilson & Wilson, 1977, p. 211). In Sumba, it has learned to eat the fruit of *Opuntia elatior,* an introduced American cactus (Dammerman, 1928, p. 301).

Relative proportions of various components of the natural diet vary seasonally and in response to severe environmental perturbations, such as forest fires (Aldrich-Blake, 1980, p. 160; Berenstain, 1986, p. 258). These proportions also vary according to the monkey's age and sex (van Schaik & van Noordwijk, 1986, p. 305). Feeding is estimated to occupy 13–55% of the daily waking hours of *M. fascicularis* (Table 31).

Predators

Known natural predators on *M. fascicularis* include crocodiles (≥ 2 species), the Komodo giant monitor, the python, the Philippine eagle, leop-

TABLE 29. Estimated home range and day range in troops of *Macaca fascicularis*.

Sample area	Habitat	Home range (ha)	Day range (m)	Number of troops	Reference[1]
		Nonprovisioned troops			
Bangladesh	Mangrove	80	325	6	*1*
West Malaysia	Mangrove	200	—	1	*2*
	Lowland forest	46.2	1,400	?	*3*
	Lowland forest	41	1,062	1	*4*
	Lowland forest	14	100	5	*5*
	Lowland forest	> 300	—	?	*5*
Sumatra	Mangrove	> 25	—	?	*6*
	Nonmangrove	75	—	?	*6*
	Lowland forest	50	1,500	7	*7*
Borneo	Lowland forest	80	700	1	*8*
	Lowland forest	125	1,900	1	*9*
	Lowland forest	112.5	1,450[2]	1	*10*
	Lowland forest	60	—	11	*11*
Simeulue	Lowland forest	12.5	—	≤ 10	*12*
		Semiprovisioned troops			
West Malaysia	Mangrove	35	—	1	*13*
Singapore	Lowland forest	33	—	1	*14*
		Urban troop			
West Malaysia	Golf course	7.2	1,009	1	*4*

[1] Key to references: *1,* M. A. R. Khan & Wahab, 1983, pp. 104, 107. *2,* Furuya, 1965, p. 288. *3,* J. R. MacKinnon & MacKinnon, 1980, p. 168. *4,* Mah & Aldrich-Blake, 1980, pp. 355–356. *5,* Caldecott, 1986a, p. 155. *6,* Crockett & Wilson, 1980, p. 168. *7,* van Schaik et al., 1983a, p. 176; 1983b, p. 213. *8,* Kurland, 1973, p. 252. *9,* Wheatley, 1980, p. 233. *10,* Berenstain, 1986, pp. 257, 260. *11,* A. Suzuki, 1991, p. 53. *12,* van Schaik & van Noordwijk, 1985a, p. 141; Sugardjito et al., 1989, p. 201. *13,* Lim & Sasekumar, 1979, p. 107. *14,* Lucas & Corlett, 1991, p. 203.

[2] Mean for 11 mo prior to a major forest fire; the mean for 4 mo after the fire is 1,300 m.

ards (2 species), and the tiger. Crocodiles (*Crocodylus* sp., *Tomistoma schlegeli*) have been observed preying on *M. fascicularis* in Thailand (Mouhot, 1864, p. 152), Sumatra (Volz, 1912, p. 369), and Borneo (Shelford, 1916, p. 10; Mjöberg, 1930, p. 25; Galdikas & Yeager, 1984, p. 50). The Komodo giant monitor (*Varanus komodoensis*) is known to prey on *M. fascicularis* in Flores and nearby P. Rintja (Hoogerwerf, 1955, p. 26; Darevsky & Kadarsan, 1964, p. 1358; Pfeffer, 1959, p. 231; Auffenberg, 1981, pp. 228, 243; Sumardja, 1981, p. 4). A python (*Python* sp.) was observed to take a juvenile *M. fascicularis* in northern Sumatra (van Schaik et al., 1983b, p. 220). The Philippine eagle (*Pithecophaga jefferi*) has been observed preying on monkeys in Samar and Mindanao (Fooden, 1991, p. 18). In western Java, leopards (*Panthera pardus*) are reported to prey on *M. fascicularis* in Ujung Kulon National Park and at Gunung Pangrango (Bartels, 1929, p. 81; Hoogerwerf, 1970, p. 402), and in eastern Java, leopards and tigers (*P. tigris*) are reported to prey on this monkey in Meru-Betiri Reserve (Seidensticker, 1983, p. 324); clouded leopards (*Neofelis nebulosa*) are reported to prey on *M. fascicularis* in Borneo (Banks, 1931, p. 77). Domestic dogs also attack and sometimes kill *M. fascicularis* (Ridley, 1895, p. 25; Seidensticker, 1983, p. 325), and humans are known to hunt this species for food (Labang & Medway, 1979, p. 56; Aggimarangsee, 1992, p. 154).

Under experimental conditions, *M. fascicularis* exhibited fear of a stuffed python and a snake model (van Schaik & Mitrasetia, 1990, p. 105; Vitale et al., 1991, p. 281). In nature, *M. fascicularis* has been observed to mob a python (van Schaik & Mitrasetia, 1990, p. 106) and to engage in antagonistic behavior directed toward crocodiles, Komodo giant monitors, and domestic dogs (Mouhot, 1864, vol. 1, p. 152; Hagen, 1890, p. 81; Auffenberg, 1981, p. 243; Wheatley, 1991, p. 172). Field studies indicate that predator detection is a major determinant of social behavior and group size in *M. fascicularis* (van Schaik et al., 1983b, p. 220; van Schaik & van Noordwijk, 1985a, p. 139).

TABLE 30. Foods reported eaten by nonprovisioned troops of *Macaca fascicularis*; dietary proportions are indicated where available.

Sample area	Foods eaten						Reference[1]
	Leaves	Fruit, seeds	Other plant parts	Insects, spiders	Crustaceans, mollusks, fish	Other animal prey	
Core area							
Bangladesh	20%	4%	25%		51%		*1*
Burma	×	×		×	×		*2*
Thailand		×		×	×		*3*
West Malaysia	×	×	×	×	×	×[2]	*4*
	16.1%	52.4%	8.3%	23.3%			*5*
	24.0%	63.7%	8.8%	4.4%		×[3]	*6*
Sumatra	×	×	×	×	×		*7*
	4.4%	63.3%		18.1%			*8*[4]
Borneo	×	×	×	×	×	×[5]	*9*
	8%	87%	3.5%	1%			*10*
Shallow-water fringing islands							
Mergui Archipelago		×			×		*11*
Singapore		×	×		×		*12*
Banggi					×		*13*
Deep-water fringing islands							
Nicobar Islands		×			×		*14*
Lesser Sundas		×	×	×	×		*15*
Philippines		×			×	×[6]	*16*
Introduced population							
Mauritus		9%	70%	14%	5%[7]		*17*[8]

[1] Key to references: *1,* M. A. R. Khan & Wahab, 1983, p. 106. *2,* Helfer, 1838, p. 858; A. P. Phayre in Blyth, 1844, p. 475; Mason, 1851, p. 220; Tickell, 1854–1875, p. [17]; Blyth, 1859, p. 275; G. C. Shortridge in Wroughton, 1915, p. 700; H. C. Smith, 21–30 Apr. 1936, BM(NH) 1936.9.10.8, 9.10.10, 9.10.14 (field tags); Pocock, 1939, p. 82. *3,* H. C. Robinson in Bonhote, 1903, p. 4; Gairdner, 1914, p. 28; Gyldenstolpe, 1914, p. 3; Fooden, 1971, p. 24; [1975], p. 99; McNeely, 1977, p. 10; Lekagul & McNeely, 1977, p. 293. *4,* Tweedie & Harrison, 1954, p. 16; Harrison, 1961, p. 7; Furuya, 1965, p. 289; Lim & Sasekumar, 1979, p. 109 (semiprovisioned troop); Lambert, 1990, p. 455. *5,* Aldrich-Blake, 1980, p. 160. *6,* J. R. MacKinnon & MacKinnon, 1980, p. 178. *7,* Volz, 1912, p. 369; F. A. Ulmer, Jr., in Miller, 1942, p. 127; Rijksen, 1978, p. 112; Crockett & Wilson, 1980, p. 164; Whitten et al., 1984, p. 136; van Schaik & van Noordwijk, 1988, p. 82. *8,* Ungar, 1994, p. 210. *9,* Shelford, 1916, p. 10; Mjöberg, 1930, p. 25; Kern, 1964, p. 185; Roedelberger & Groschoff, 1967, p. 30; Kurland, 1973, p. 254; Rodman, 1978, p. 469; Fittinghoff & Lindburg, 1980, p. 190; Wheatley, 1980, p. 216; Joines, 1981, p. 9; Macdonald, 1982, p. 63; Leighton & Leighton, 1983, p. 185; Berenstain, 1986, p. 257; *10,* Wheatley, 1978, p. 348; reported diet also includes 0.5% clay. *11,* Carpenter, 1887, p. 53; H. C. Smith, 20–23 Apr. 1936, BM(NH) 1936.9.10.4–6, 1936.9.10.11. *12,* Ridley, 1895, p. 24; Chasen, 1924a, p. 79; Lucas & Corlett, 1991, p. 203 (semiprovisioned troop). *13,* Shukor Md. Nor, pers. comm., 11 Jul. 1991. *14,* Kloss, 1903a, p. 129; Das & Ghosal, 1977, p. 266; Kalra, 1980, p. 50. *15,* Dammerman, 1928, p. 301; Pfeffer, 1959, p. 198; Auffenberg, 1981, p. 242. *16,* Fooden, 1991, p. 18. *17,* Sussman & Tattersall, 1981, p. 200.

[2] Sipunculid worms; lizards.

[3] Frogs.

[4] 14.2% of diet is unspecified.

[5] Birds' eggs or nestlings.

[6] Earthworms; lizards; birds.

[7] Includes all invertebrates.

[8] 2% of diet is unspecified.

Intertroop Behavior

Judging from reports of long-term observations, direct encounters between adjacent nonprovisioned troops are relatively rare (West Malaysia [Aldrich-Blake, 1980, p. 151], Sumatra [van Schaik & van Noordwijk, 1988, p. 80], Kalimantan [Fittinghoff & Lindburg, 1980, p. 206], Java [Angst, 1973, p. 626]), which suggests mutual avoidance. In Sumatra, however, small daughter troops frequently encounter the large troops from which they have split (van Schaik & van Noordwijk, 1988, p.

TABLE 31. Daily waking-hour[1] time budget estimates (%) for *Macaca fascicularis*.[2]

Sample area	Activity			Reference
	Feeding	Travel	Other	
Bangladesh				M. A. R. Khan & Wahab, 1983, p. 106
Ebb tide	55	15	30	
Full tide	22	3	75	
West Malaysia	35	20	45[3]	Aldrich-Blake, 1980, p. 161
Kalimantan	13	45	42	Wheatley, 1980, p. 221
Mauritius (introduced)	32	4	64	Sussman & Tattersall, 1981, p. 197

[1] Estimates of total daily waking hours: West Malaysia, 13 hr (J. R. MacKinnon & MacKinnon, 1980, p. 185); Sumatra, 12.5 hr (van Schaik & van Noordwijk, 1988, p. 85); Kalimantan, 11.4 hr (Wheatley, 1980, p. 222).

[2] Cf. Lim and Sasekumar (1979, p. 111), J. R. MacKinnon and MacKinnon (1980, p. 185), and Leon et al. (1993, p. 177).

[3] Computed by subtraction.

80), and in P. Peutjan, an islet off western Java that is densely populated by *M. fascicularis* (see above), adjacent troops are often intermixed (Angst, 1973, p. 626). Intertroop displays that may function to maintain intergroup spacing have been reported in West Malaysia and Kalimantan. In P. Simeulue, west of Sumatra, *M. fascicularis* has a unique rapid bark that probably functions in intertroop communication (van Schaik & van Noordwijk, 1985a, p. 143). During intertroop encounters in Sumatra, copulations between members of different troops have been observed infrequently (van Noordwijk, 1985, p. 289). In Brunei, northern Borneo, a larger troop was observed to displace a smaller troop (Macdonald, 1982, p. 71). In artificially provisioned troops, intertroop fighting is frequent (Furuya, 1965, p. 288; Angst, 1975, p. 373; Norikoshi, 1984, p. 11; Koyama, 1984, p. 25; Wheatley, 1991, p. 171).

Macaca fascicularis males have been observed to leave one troop and take up residence in another troop in northern Sumatra (Rijksen, 1978, p. 111; van Noordwijk & van Schaik, 1985, p. 851), western Sumatra (Norikoshi, 1984, p. 2; Koyama, 1984, p. 20; 1985, p. 119), eastern Kalimantan (Wheatley, 1982, p. 207; Berenstain, 1986, p. 258), and Bali (Koyama et al., 1981, p. 8). Such intertroop movement by males presumably is universal in natural populations of this species, as in other species of macaques. Males apparently leave their natal troop as late juveniles or subadults, before about age 7 years, and most males probably change troops several more times during their life; intertroop movement apparently precludes close inbreeding in natural troops (Ruiter et al., 1992, p. 186). In six troops studied in northern Sumatra, 40 of 44 adult and subadult (immigrant) males that were present in January 1980 had emigrated by March 1984. In western Sumatra, the mean duration of troop residence of an adult male was estimated to be 1.2 years. Most intertroop movements by males in northern Sumatra occurred near the beginning of the peak copulatory season. The maximum recorded interval between a male's emigration from one troop and immigration into another troop was 2 months (semisolitary interval). Immigration of a new male often is followed by changes in a troop's dominance hierarchy. Females also occasionally move from one troop to another, but apparently at a much lower frequency than males (5 of 57 recorded migrations in northern Sumatra; 1 of 7 in western Sumatra; 0 of 11 in eastern Kalimantan; 0 of 2 in Bali; total, 6 of 77 = 7.8%).

Interspecific Behavior

Interactions have been reported between *M. fascicularis* and *M. nemestrina,* leaf monkeys (*Presbytis* spp., *Trachypithecus* spp.; cf. Groves, 1993, p. 270), *Nasalis larvatus, Hylobates* spp., and *Pongo pygmaeus.* In a 3-km^2 study area in eastern Kalimantan, Rodman (1973, p. 657) found that the local occurrence of *M. fascicularis* was negatively correlated with that of *M. nemestrina, Presbytis aygula* (= *P. hosei*), *Hylobates moloch,* and *Pongo pygmaeus.*

Noncompetitive associations of *M. fascicularis* and *M. nemestrina* have been observed in West Malaysia (Bernstein, 1967, p. 201), and seven mixed troops of these species have been recorded in Sumatra (Rijksen, 1978, p. 111, single *M. fascicularis* individuals in six *M. nemestrina* troops; Crockett & Wilson, 1980, p. 175, *M. nemestrina* individual in *M. fascicularis* troop). These two species, however, generally occupy different ecologi-

cal niches; *M. fascicularis* is rare in primary evergreen rain forest, which is favored by *M. nemestrina* (Rodman, 1973, p. 656; 1978, p. 476; 1991, p. 364; J. R. MacKinnon & MacKinnon, 1978, p. 316; Crockett & Wilson, 1980, p. 162).

Macaca fascicularis and *Trachypithecus cristatus* frequently have been observed together in West Malaysia (Furuya, 1961–1962b, p. 56; Bernstein, 1968b, p. 8; Lim & Sasekumar, 1979, p. 108), Sumatra (Wilson & Wilson, 1973, p. 5), and Java (Hoogerwerf, 1970, p. 408, including three interspecific mixed groups). Relations between these species reportedly are generally peaceful, but *M. fascicularis* often displaces *T. cristatus.* Hoogerwerf (1970, p. 408) observed one violent interspecific fight in Java, during which an immature *T. cristatus* ". . . fell to the ground torn to pieces."

Associations of *M. fascicularis* and *Presbytis melalophos* have been observed in West Malaysia (Bernstein, 1967, p. 201; J. R. MacKinnon & MacKinnon, 1978, p. 319) and Sumatra (Snelleman, 1887, p. 10; Koyama, 1985, p. 105). Most accounts indicate that these associations are peaceful. Koyama (1985, p. 105) reported that these two species often share the same sleeping tree, but J. R. MacKinnon and MacKinnon (1978, p. 319) indicated that *M. fascicularis* displaces *P. melalophos* from feeding and sleeping trees.

Bernstein (1967, p. 201) reported noncompetitive association of *M. fascicularis* with *Trachypithecus obscurus* in West Malaysia, and Kurland (1973, p. 254) reported noncompetitive association with *Presbytis aygula* (= *P. hosei*) in Kalimantan. Ridley (1895, p. 25) reported that leaf monkeys in West Malaysia fought for more than 2 hours with *M. fascicularis* over occupation of a feeding tree ("biting them [*M. fascicularis*] and throwing them out of the tree and into the river"). Banks (1978, p. 188) reported that *M. fascicularis* often prevented leaf monkeys in Borneo from entering sleeping trees. Peaceful association of *M. fascicularis* and *Nasalis larvatus* in mangrove swamps in Borneo has been observed frequently (Davis, 1962, p. 57; Kern, 1964, p. 185; Kawabe & Mano, 1972, p. 216; Kurland, 1973, p. 254; Macdonald, 1982, p. 117).

Noncompetitive association of *M. fascicularis* and *Hylobates lar* in West Malaysia was reported by Bernstein (1967, p. 201). *Macaca fascicularis* and *Pongo pygmaeus* have been observed together on 32 occasions in Sumatra (Rijksen, 1978, p. 112) and on two occasions in Kalimantan (Fittinghoff & Lindburg, 1980, p. 201); these observations include peaceful interspecific sharing of feeding and sleeping trees and rudimentary interspecific threats—a few by *P. pygmaeus* and one by *M. fascicularis.*

In West Malaysia, racket-tailed drongos (*Dicrurus paradiseus*) have been observed following *M. fascicularis* through the canopy and catching insects stirred up by the monkeys' activity (Ridley, 1901, p. 105; cf. Fooden, 1969, p. 52).

Reproduction

Although copulations, pregnancies, and births have been recorded throughout the year in natural populations of *M. fascicularis,* long-term studies indicate that all three of these reproductive events exhibit seasonal peaks in this species (Appendix 11). The timing of these reproductive peaks apparently varies geographically and varies between years at the same locality. In a study in northern Sumatra, the annual birth peak tended to occur during or shortly after the local fruiting peak; in years when fruit production was relatively low, the birth peak tended to be delayed by 2 or 3 months (van Schaik & van Noordwijk, 1985b, p. 538). In Thailand, on the other hand, fertile matings—not births—tend to peak shortly after the fruiting peak, which occurs in April–June (Varavudhi et al., 1989a, pp. 221–222; cf. Tangpraprutigul & Varavudhi, 1982, p. xci; Aggimarangsee, 1992, p. 129). In a 2- to 3-year study of captive *M. fascicularis,* annual variation of sperm concentration in semen collected by electroejaculation was investigated (Okamoto, 1994, p. 27); results were inconclusive.

In natural populations of *M. fascicularis,* females probably become reproductively active at about age 3.5 years. A pregnant juvenile female, aged about 3.5 years, was collected in western Thailand (FMNH 99646, with erupting C_1, P_3, and M^2; cf. Table 14; Fooden, 1971, p. 24), and females in Sumatra reportedly produce their first infants at about age 4 years (Koyama, 1985, p. 106; van Noordwijk & van Schaik, 1987, p. 586; cf. Varavudhi et al., 1989a, p. 222). In captivity, females may copulate as early as age 2.5 years (Chance et al., 1977a, p. 619), and one captive female is known to have given birth at age 3 years (Timmermans et al., 1981, p. 121); however, fertility in captive females usually does not begin until about age 4 years (Spiegel, 1954, p. 230; Dang, 1983, p. 38).

Mean age at menarche in 43 captive females was 2.5 ± 0.7 years (Honjo et al., 1984, p. 69; cf. Dang, 1983, p. 36). Mean length of the menstrual

cycle in 28 captive females was 30.9 days (SD = 4.8 days, extremes = 19–43 days, mode = 28 days, n = 595 cycles) (Dukelow, 1977, p. 34; cf. Joachimovitz, 1928, p. 462; Corner, 1932, p. 404; Spiegel, 1954, p. 235; Fujiwara et al., 1967, p. 506; Kerber & Reese, 1969, p. 976; Valerio et al., 1969, p. 287; MacDonald, 1971, p. 374; Nawar & Hafez, 1972, p. 45; Dang, 1977, p. 3; Goodman et al., 1977, p. 480; Zumpe & Michael, 1983, p. 58; Honjo et al., 1984, p. 63; Wallis et al., 1986, p. 87).

Males in natural populations usually begin to copulate at age 5–6 years, as subadults, after they have left their natal troops (van Noordwijk, 1985, p. 288; van Noordwijk & van Schaik, 1985, p. 852; cf. Varavudhi et al., 1989a, p. 222). As previously indicated (see above, Natural History), close inbreeding probably is rare or absent in natural populations of *M. fascicularis*. In Sumatra, subadult males that were still in their natal troops accounted for only 5 of 664 observed copulations. In Bangladesh, copulation attempts by immature males were actively thwarted by adult males (M. A. R. Khan & Wahab, 1983, p. 108).

In captive males, testicular descent occurs at age 2.5 years, and adult testicular size is achieved at age 4.0–4.5 years (Cho et al., 1973, p. 408; Chance et al., 1977a, p. 619). Fertile copulations have been recorded for three captive males at ages 3.5 years (1 male; Honjo et al., 1984, p. 68) and 3.8 years (2 males; Spiegel, 1954, p. 230).

At or near the onset of sexual maturity in females, the bare skin between the root of the tail and the anus swells prominently and the skin around the vulva frequently reddens (Joachimovitz, 1928, p. 464; Corner, 1932, p. 408; Spiegel, 1954, p. 232; Nawar & Hafez, 1972, p. 49; Fooden, [1975], p. 100; Emory et al., 1980, p. 250; van Noordwijk, 1985, p. 281; Meishvili & Chalyan, 1986, p. 14; C. M. Anderson & Bielert, 1994, p. 285). This pubertal swelling and reddening apparently reaches its maximum about midway through the menstrual cycle and diminishes a few days later. In postpubertal females, sexual swelling and reddening generally are less conspicuous and are highly variable in size and duration; in many fully fertile females, sexual swelling and reddening are slight or absent (cf. Pocock, 1906, p. 558; 1939, p. 78; Kurland, 1973, p. 258; Wilson & Wilson, 1977, p. 211; Fittinghoff & Lindburg, 1980, p. 189). However, in a carefully studied population in northern Sumatra, sexual swellings generally were larger during the peak copulation season (Jan.–Jun.), and copulations and consortships of most females tended to increase with increasing size of their sexual swelling or increasing redness of their perivulval skin (van Noordwijk, 1985, pp. 281, 287). In some females, sexual swelling or reddening and copulations were observed during pregnancy (cf. Deputte & Goustard, 1980, p. 96); following parturition, swelling was not observed for several months.

Variably complete and generally concordant accounts of copulatory behavior in *M. fascicularis* are available from natural populations (Tickell, 1854–1875, p. [17]; Furuya, 1961–1962a, p. 76; Kurland, 1973, p. 258; M. A. R. Khan & Wahab, 1983, p. 104; Koyama, 1984, p. 31; 1985, p. 107; van Noordwijk, 1985, p. 281), introduced free-ranging populations (Poirier & Smith, 1974, p. 300; Sussman & Tattersall, 1981, p. 203), colony groups (Spiegel, 1954, p. 238; Goustard, 1961, p. 313; 1963, p. 710; 1968, p. 464; Furuya, 1965, p. 313; de Benedictis, 1973, p. 1470; Angst, 1974, p. 52; Chevalier-Skolnikoff, 1975, p. 207; Emory & Harris, 1978, p. 227; Deputte & Goustard, 1980, p. 85; Emory et al., 1980, p. 251; Shively et al., 1982, p. 375), and laboratory test pairs (Kanagawa et al., 1972, p. 453; Kanagawa & Hafez, 1973, p. 234; Michael & Zumpe, 1988, p. 379; Zumpe & Michael, 1983, p. 58; 1990, p. 148). Copulations in this species have been observed throughout the day, but evidence from troops in northern Sumatra suggests that copulations may be more frequent in the morning (ca. 60%) than in the afternoon (van Noordwijk, 1985, p. 286; cf. de Benedictis, 1973, p. 1473; Sussman & Tattersall, 1981, p. 203). Copulations occur both in trees and on the ground (Kurland, 1973, p. 258; Angst, 1974, p. 53; Sussman & Tattersall, 1981, p. 203; Koyama, 1985, p. 117).

Copulations in *M. fascicularis* may be initiated by either sex. A female initiates copulation by staring at or approaching a male and presenting her hindquarters or by stereotyped head or arm movements; in laboratory test pairs, female use of head or arm movements to initiate copulation peaked near the middle of the menstrual cycle (Michael & Zumpe, 1988, p. 381). A male initiates copulation by staring at or approaching a female and raising her tail. Both female- and male-initiated copulations usually proceed with examination by the male of the perineum of the female; this examination may be visual, digital, olfactory, or, rarely, lingual. If the female is acceptable (cf. de Benedictis, 1973, pp. 1479–1480), the male mounts the female, by gripping her hips with his hands and gripping her calves with his feet, and begins pelvic thrusting. In laboratory test pairs, mounts

TABLE 32. Copulatory behavior data in two *Macaca fascicularis* groups.

	Provisioned natural group, Bali	Colony group, USA
Ejaculatory copulations observed (N)	169	17
SME copulations (N)	139 (82.2%)	8 (47.1%)
Duration of SME mount[1] (sec)	7.1 (2.6–12.0)	8.5 (6–14)
Thrusts per SME mount[1]	16.4 (5–32)	17 (14–21)
MME copulations (N)	30 (17.8%)	9 (52.9%)
Duration of MME mount[1] (sec)	6.4 (3.0–9.4)	6 (2–11)
Thrusts per MME mount[1]	15 (6–31)	13 (4–29)
Duration of MME sequence[1] (min)	7.1 (2–35)	41 (2–85)
Mounts per MME sequence[1]	2.4 (2–6)	3 (2–6)
Reference	Wheatley, 1991, p. 171	Shively et al., 1982, p. 376

[1] Mean and extremes.

and mounting attempts tended to increase slightly during the first half of the menstrual cycle and tended to decrease more precipitously during the second half (Zumpe & Michael, 1983, p. 66).

Ejaculation in *M. fascicularis* may occur either as a result of a single mount (single-mount ejaculations [SME]) or as a result of a series of mounts separated by dismounts (multiple-mount ejaculation [MME]). In a provisioned natural group in Bali, 82% of observed ejaculatory copulations were SME and 18% were MME; in a seminatural colony group, 47% of observed ejaculatory copulations were SME and 53% were MME (Table 32; cf. Furuya, 1961–1962a, p. 76; van Noordwijk, 1985, p. 281). In laboratory tests, the frequency of SME was higher in first copulations of test pairs than in second copulations (27% of 191 first copulations, 6% of 154 second copulations) (Zumpe & Michael, 1983, p. 60; cf. Kanagawa et al., 1972, p. 453). In the natural and colony groups, the duration of both SME and MME mounts averaged about 7 seconds, and the number of pelvic thrusts per mount averaged about 15 (cf. Furuya, 1965, p. 313; Zumpe & Michael, 1983, p. 61); similar mount durations and thrust/mount rates have been reported for natural populations of *M. fascicularis* in Bangladesh (10–15 seconds, 8–10 thrusts/mount; M. A. R. Khan & Wahab, 1983, p. 108) and Kalimantan (5–7 sec, 4–12 thrusts/mount; Kurland, 1973, p. 258) and for a free-ranging introduced population in Angaur Island ("brief," 8–10 thrusts/mount; Poirier & Smith, 1974, p. 300). The number of mounts in an MME sequence averaged about 3 in the natural and colony groups; the duration of an MME sequence averaged about 7 minutes in the natural group and about 41 minutes in the colony group.

Copulation in *M. fascicularis* usually is accompanied by a characteristic staccato female vocalization and sometimes by a characteristic male vocalization (Goustard, 1963, p. 710; 1968, p. 470; Furuya, 1965, p. 313; Angst, 1974, p. 61; Poirier & Smith, 1974, p. 300; Chevalier-Skolnikoff, 1975, p. 207; Deputte & Goustard, 1980, p. 83; Wheatley, 1982, p. 206; 1984, p. 391; 1991, p. 171; Zumpe & Michael, 1983, p. 60; van Noordwijk, 1985, p. 281). At or near the time of ejaculation, the male pauses, and the female usually grasps one of the male's arms or legs and turns her face toward his (cf. Kanagawa et al., 1972, p. 453). Shortly after ejaculation, the male dismounts and the male and female move apart. After copulation, a pair may remain associated in a consortship for a variable period, ranging from about 1 hour to 3 weeks (Furuya, 1965, p. 314; Poirier & Smith, 1974, p. 301; Sussman & Tattersall, 1981, p. 203; van Noordwijk, 1985, p. 283); during a consortship, most, but not all, copulations of consortship partners are with each other. In natural groups, females may copulate as often as 3–4 times per hour, throughout the day, often with many different partners (Ruiter et al., 1992, p. 177).

Dominant males in *M. fascicularis* apparently participate in a disproportionately large share of copulations. In northern Sumatra, the highest ranking 2 of 7 males engaged in 52.7% of 659 copulations (van Noordwijk, 1985, p. 285); in western Sumatra, 2 of 7 males engaged in 60.9% of 46 ejaculatory copulations (Koyama, 1984, p. 35; cf. Norikoshi, 1984, p. 12); in eastern Kalimantan, 1 of 6 males engaged in 50.0% of 48 copulations (Wheatley, 1982, p. 207; alpha status shifted during this study); and in Bali, 1 of 4 males engaged in 50.9% of 126 copulations (Wheatley, 1991, p. 171). Similar high frequencies of copulation by dominant males have been reported in

colony groups (Furuya, 1965, p. 315; Shively et al., 1982, p. 377). In natural and colony groups, some low-ranking adult males were never observed to copulate. In laboratory test pairs, the copulatory performance of a subordinate male was strongly inhibited by close proximity of a separately confined dominant male (Zumpe & Michael, 1990, p. 154). In West Malaysia and Kalimantan, aggression between males reportedly intensified shortly before periods of increased sexual activity (Aldrich-Blake, 1980, p. 151; Wheatley, 1982, p. 210). In troops observed in northern and western Sumatra, subordinate males frequently attempted to interfere with the copulations of dominant males, who, in turn, responded aggressively (Norikoshi, 1984, pp. 9, 12; Koyama, 1985, p. 107; van Noordwijk, 1985, p. 283). The copulatory partners of high-ranking males in Sumatra generally tended to be females who were high ranking, not young, and not nulliparous (van Noordwijk, 1985, p. 289).

Paternity tests, using blood-protein analysis and DNA fingerprinting, have been conducted for 45 offspring in three troops in northern Sumatra (Ruiter et al., 1992, p. 184; cf. Ruiter, 1993, p. 99; Ruiter & van Hooff, 1993, p. 518; Ruiter et al., 1994, p. 211); these tests indicate that dominant males sire most of the offspring in natural troops, as would be expected from observed copulation frequencies. Of 42 offspring for which probable fathers could be determined, 31 probably were sired by alpha males, 7 by beta males, and only 4 by approximately 10 lower ranking males. In artificial colony groups, dominant males apparently do not maintain this reproductive advantage; paternity tests in one colony revealed that, despite their higher frequency of copulations, dominant males did not sire a disproportionately large number of offspring (Shively & Smith, 1985, p. 131).

In a large captive group of *M. fascicularis,* mean gestation length for 1,141 live births was 163.5 ± 5.8 (SD) days (Honjo et al., 1984, pp. 63–64); in other captive groups, reported mean gestation lengths vary from 160.0 to 168.0 days (extremes 141–225 days) (Spiegel, 1954, p. 245; T. Fujiwara & Imamichi, 1966, p. 226; Valerio et al., 1969, p. 295; MacDonald, 1971, p. 374; Dang, 1977, p. 2; 1983, p. 41; Dukelow et al., 1979, p. 44; Varavudhi et al., 1989a, p. 222). Mean birth weight in the large captive group was 318.2 ± 45.2 g for 563 female infants and 347.5 ± 55.2 g for 600 male infants. The ratio of male infants to female infants tends to be greater for high-ranking captive females than for low-ranking females (van Schaik et al., 1989, p. 151). Most births probably occur between sunset and sunrise; in a captive group maintained in a 14-hour light/10-hour dark environment, 90% of 152 observed births occurred during dark hours, 1900–0500 (M. T. Suzuki et al., 1990, p. 252; cf. Ridley, 1906, p. 142; Spiegel, 1954, p. 248; Erwin, 1977, p. 358; Banks, 1978, p. 188; Kemps & Timmermans, 1982, p. 84).

In captivity, 23 infants were nursed for an average of 15.1 months (SD = 3.0 mo, extremes = 9–22 mo) (Spiegel, 1954, p. 262; cf. Chance et al., 1977b, p. 31); following 9 of these 23 nursing periods, the mother's lactation continued without interruption through the nursing of one or more succeeding infants. In natural populations, infants begin to obtain some of their food independently about age 3 months (Karssemeijer et al., 1990, p. 288). The mean duration of postpartum amenorrhea in captive nursing mothers was 6.6 months (SD = 2.6 mo, extremes = 2–13 n = 28) (Spiegel, 1954, p. 262; cf. Dang, 1979, p. 377; Cho, 1981, p. 254; Honjo et al., 1984, p. 66; Varavudhi et al., 1989a, p. 221).

In northern Sumatra, in six to seven nonprovisioned troops that included 42–53 adult females, the annual birth rate (births/adult females) from 1980–1981 to 1983–1984 was 0.45, 0.82. 0.30, and 0.75; the overall annual birth rate for these 4 years was 0.58 (van Schaik & van Noordwijk, 1985b, p. 538). In western Sumatra, in three provisioned troops that included 22–31 adult females, the annual birth rate from 1980 to 1984 was 0.73, 0.48, 0.81, 0.11, and 1.00, with an overall average of 0.63 (Koyama, 1985, p. 119). High and low annual birth rates tend to occur in alternate years in both the nonprovisioned and provisioned troops. The limited available data suggest that a biennial birth cycle may be common in these Sumatran troops and that most females may tend to produce their young during the same alternate years.

In provisioned troops at Ubud, Bali, where the number of adult females varied from 27 to 46, the annual birth rate reported in 1986 and 1990–1992 was 0.59, 0.32, 0.41, and 0.33 (Wheatley & Harya Putra, 1994, p. 248). In four free-ranging provisioned groups of *M. fascicularis* introduced in P. Tinjil, south of Java, the annual birth rate is estimated to be 0.56 (Kyes, 1993, p. 81). In captivity, *M. fascicularis* females are capable of producing young every year (Ridley, 1895, p. 24; Chance et al., 1977a, p. 612; cf. Hadidian & Bernstein, 1979, p. 440; Timmermans et al., 1981, p. 120; Dang, 1983, p. 41; Honjo et al., 1984, p. 66).

Effective fertility in females probably ceases at

TABLE 33. Macaque fossils or subfossils collected within geographic range of *Macaca fascicularis*.

Locality	Epoch	Estimated age (Ka)	Number of fossils or subfossils reported			Reference[1]
			M. fascicularis	*M. nemestrina*	*Macaca* sp.	
West Malaysia						
Bukit Chintamani	Holocene	?		1		*1*
Kota Tongkat	Holocene	< 4		1		*1*
Gua Cha, Trench 79A	Holocene	?		≥ 1		*2*
Gua Cha, Trench 79B	Holocene	< 3	≥ 1			*2*
Gua Cha, Trench 79B	Holocene	6.3		≥ 1		*2*
Gua Madu	Holocene	7		≥ 1		*3*
Sumatra						
Djamboe Cave	Holocene/Pleistocene[2]	?		11		*4*
Lida Ajer Cave	Holocene/Pleistocene[2]	?	1	6	1	*4*
Sibrambang Cave	Holocene/Pleistocene[2]	?	5	74	10	*4*
Unspecified cave	Holocene/Pleistocene[2]	?	1	11	4	*4*
Borneo: Sarawak						
Paku Cave	?Holocene	?	4[3]			*5*
Unspecified cave	?Holocene	?		1[3]		*5*
Niah Cave	Holocene[4]	5	21	4		*6*
Niah Cave	Pleistocene[4]	15	37			*6*
Niah Cave	Pleistocene[4]	25	7			*6*
Niah Cave	Pleistocene[4]	35	5	1		*6*
Java						
Sampung	Holocene	5[5]	3			*7*
Goea Djimbe	Holocene	10	26			*4*
Goea Ketjil	Holocene	10	1			*4*
Cave near Wajak	Holocene	10	1[6]			*4*
Punung	Pleistocene	120[2]			16	*8*
Ngandong	Pleistocene[7]	< 800	1[8]			*9*
Sangiran (?Kabuh)	Pleistocene[7]	800	1	1		*10*
Sangiran	Pleistocene[7]	?800	2			*11*
Glagahombo (Kabuh)	Pleistocene[7]	800			1	*12*
Kali Brangkal (Kabuh)	Pleistocene[7]	800			1	*12*
Ndangklampok (Kabuh)	Pleistocene[7]	800			1	*12*
Saradan	Pleistocene[7]	?800	1			*13*
Trinil	Pleistocene[7]	1,000	7			*4*
Trinil	Pleistocene[7]	1,000	1			*14*
Bangle	Pleistocene[7]	?1,000	2			*4*
Flores						
Liang Toge	Holocene	3.5[9]	1			*15*
Timor[10]						
Bui Ceri Uato	Holocene	< 1.5	2			*16*
Uai Bobo 1	Holocene	1.6	2			*16*
Lie Siri	Holocene	< 4.3	1[3]			*16*
Uai Bobo 2	Holocene	4.5	4			*16*

[1] Key to references: *1,* Matthews, 1961, pp. 18, 41; Dunn, 1975, p. 122. *2,* Adi, 1985, pp. 66–67. *3,* Tweedie, 1940, p. 7. *4,* Hooijer, 1962b, pp. 50, 54–55, 58. *5,* P. H. Napier, 1981, pp. 9, 20. *6,* Hooijer, 1962a, p. 440. *7,* Dammerman, 1934, p. 492. *8,* Badoux, 1959, p. 88; J. de Vos, 1983, p. 421; J. de Vos et al., 1994, pp. 132, 134. *9,* Aziz, 1989, p. 52. *10,* Aimi, 1981, p. 409. *11,* Hooijer, 1964, p. 76. *12,* Aimi & Aziz, 1985, pp. 161–163. *13,* Deninger, 1910, p. 1; Hooijer, 1962b, p. 54; Aimi, 1981, p. 412. *14,* Stremme, 1911, p. 140; Hooijer, 1962b, p. 54. *15,* Hooijer, 1967, p. 160. *16,* Glover, 1986, pp. 78, 121, 158, 192.

[2] See J. de Vos (1983, p. 422); J. de Vos et al. (1994, p. 132).

[3] Minimum number of individuals; species identification tentative.

[4] For tabulation details, see Fooden (1975, p. 61).

[5] See Bellwood (1985, p. 200).

[6] Cf. Brink (1982, p. 180).

about age 20 years (Spiegel, 1954, p. 265; Angst & Thommen, 1977, p. 212; van Noordwijk & van Schaik, 1987, p. 587), which suggests that an average female in a natural population may produce about eight to nine infants during her reproductive life (age ca. 4–20 yr). The maximum known life span in captive *M. fascicularis* is 37 years 1 month (M. L. Jones, 1982, p. 117; cf. Dumond, 1967, p. 203; Angst, 1975, p. 350; van Noordwijk & van Schaik, 1988, p. 30).

In northern Sumatra, neonatal infant mortality (deaths before age 3 mo/births) from 1980–1981 to 1983–1984 was 0.21, 0.12, 0.25, and 0.06, with an overall average of 0.14 (van Schaik & van Noordwijk, 1985b, p. 538); neonatal infant mortality was high in years when the birth rate was low (see above). The average infant death rate before age 1 year was 0.22 in northern Sumatra (van Noordwijk & van Schaik, 1987, p. 585); this infant death rate is comparable to that reported in a provisioned free-ranging group at Ubud, Bali (0.25; Wheatley & Harya Putra, 1994, p. 248), and in a large captive group of *M. fascicularis* (> 0.15; Luder, 1993, p. 142). Infanticide, committed by adult males, probably is one of the important causes of infant deaths (cf. Thompson, 1967, p. 18; Washburn & Hamburg, 1968, p. 473; Angst & Thommen, 1977, p. 208; Erwin, 1977, p. 359; Timmermans et al., 1981, p. 120; Wheatley, 1982, p. 211; Pallaud, 1984, p. 92; Koyama, 1985, p. 106; van Noordwijk & van Schaik, 1987, p. 585; Ruiter et al., 1994, p. 218).

In the Ketambe study area, northern Sumatra, a natural nonprovisioned population of *M. fascicularis* increased from 70–75 in 1972 to more than 190 in 1986 (van Schaik & van Noordwijk, 1988, p. 94), an annual rate of increase of about 7%; at this rate, which obviously is not indefinitely sustainable, the population would double every 10.5 years. The introduced nonprovisioned population in Angaur increased in less than 75 years from a few individuals to 480–600 in 1973 (Poirier & Smith, 1974, pp. 264, 271; cf. Kawamoto et al., 1988, p. 176; Matsubayashi et al., 1989, p. 54). In Mauritius, another introduced nonprovisioned population apparently increased in less than 500 years from a few individuals to about 30,000 (Sussman & Tattersall, 1986, pp. 30, 38; Lawler et al., 1995, p. 138). In Florida, a seminatural menagerie group increased from 6 individuals (4 females, 2 males) in 1933 to about 150 individuals in 1966 (Dumond, 1967, p. 203), an annual rate of increase of about 10%.

Fossils and Subfossils

Known fossils indicate that *M. fascicularis* has inhabited the Sunda Shelf since at least later Early Pleistocene, approximately 1 Ma (Table 33). All of the earliest macaque fossils in this area, dating from 0.8 to 1.0 Ma, have been collected in Java, where, at this time, *M. fascicularis* apparently was sympatric with *M. nemestrina.* In Java, *M. fascicularis* fossils of this age outnumber those of *M. nemestrina,* but most of these fossils consist of isolated teeth or small jaw fragments, and some may be misidentified.

The long period from 800 Ka to 35 Ka has yielded no macaque fossils within the present geographic range of *M. fascicularis.* However, fossils and subfossils of *M. fascicularis* and *M. nemestrina* have been collected in subsequent Late Pleistocene and Holocene deposits in West Malaysia, Sumatra, Borneo, and Java (*M. fascicularis* fossils only). In these deposits in Borneo and Java, *M. fascicularis* fossils and subfossils outnumber those of *M. nemestrina.* In deposits in West Malaysia and Sumatra, by contrast, *M. nemestrina* fossils and subfossils outnumber those of *M. fascicularis.* This is anomalous, because, at present, *M. fascicularis* generally outnumbers *M. nemestrina* in the broad area of overlap of their respective ranges, except in the interior of primary evergreen rain forest (Fooden, 1975, p. 61; above, Natural History). The explanation for the anomalous relative frequencies of fossils and subfossils of these species in Sumatra and West Malaysia is unclear.

In the Lesser Sunda Islands, Holocene subfossils of *M. fascicularis,* consisting of human food re-

←

[7] Age estimates from Theunissen et al. (1990, p. 51; cf. Swisher et al., 1994, p. 1119; J. de Vos & Sondaar, 1994, p. 1726; Swisher, 1994, p. 1727).

[8] Cf. Koenigswald (1951, p. 219) and Medway (1972c, p. 80).

[9] See Musser (1981, p. 72).

[10] Age estimate indicates age of earliest fossil collected at each locality; number of fossils indicates minimum number of individuals collected at each locality.

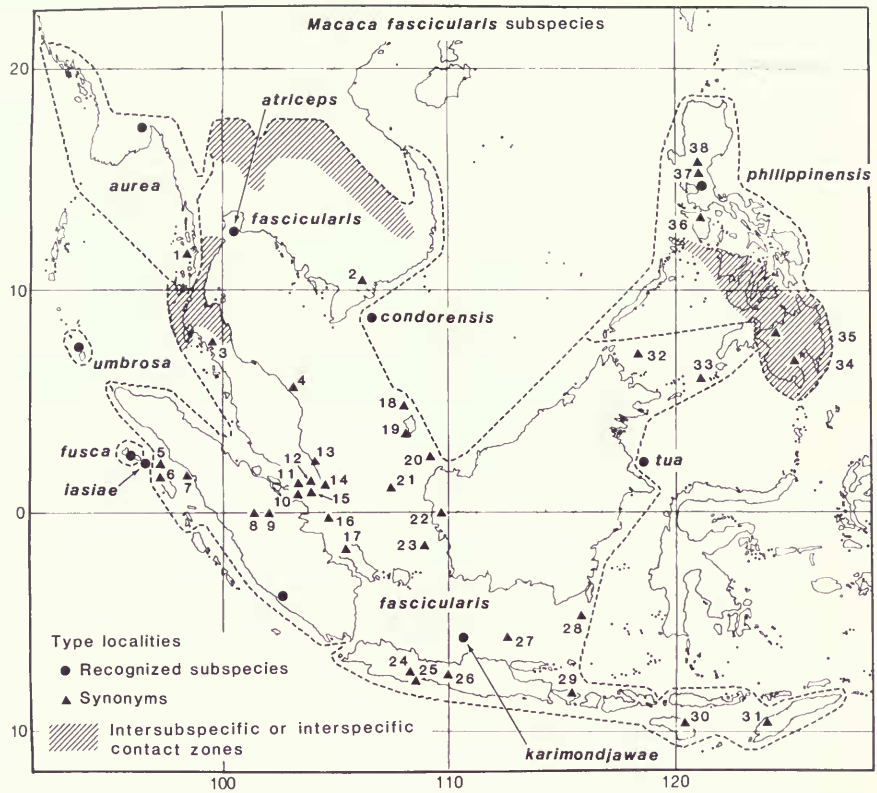

FIG. 25. Type localities and limits of distribution of recognized subspecies of *Macaca fascicularis* and type localities of synonymous nominal species or subspecies (cf. Fig. 1; Fooden, 1982, p. 576); in the Philippine Islands, the indicated intersubspecific contact zone includes an area for which the subspecies is undetermined (cf. Fooden, 1991, p. 25). Because the geographic origins of the holotypes of *Macacus cristatus* Gray, 1870, and *Macacus cynomolgus* . . . var. *Cumingii* Gray, 1870, are inadequately known, these two synonyms of *M. fascicularis* are excluded from this figure (see Fooden, 1991, pp. 23, 24). Key to type localities of synonyms of recognized subspecies:

M. f. aurea

1. *Pithecus vitiis* Elliot, 1910; Burma, Letsok-aw Kyun.

M. f. fascicularis

2. *Pithecus validus* Elliot, 1909; Vietnam: "Cochin China."
3. *Pithecus capitalis* Elliot, 1910; Thailand, Trang Province: Ban Phra Muang.
4. *Macaca irus argentimembris* Kloss, 1911b; Malaysia, West Malaysia, P. Pinang [2].
5. *Pithecus agnatus* Elliot, 1910; Indonesia, P. Tuangku.
6. *Macacus phaeura* Miller, 1903b; Indonesia, P. Nias: Teluk Siaba.
7. *Pithecus mansalaris* Lyon, 1916; Indonesia, P. Mursala.
8. *Macacus irus* I. Geoffroy, 1826; Indonesia, Sumatra.
9. *Macacus carbonarius* I. Geoffroy, 1826; Indonesia, Sumatra (technical name also mistakenly applied to *M. f. aurea* and *M. f. umbrosa*).
10. *Pithecus alacer* Elliot, 1909; Indonesia, P. Kundur: Selatbliat.
11. *Pithecus karimoni* Elliot, 1909; Indonesia, P. Karimun: Monos.
12. *Pithecus dollmani* Elliot, 1909; Singapore, Singapore I.: Changi.
13. *Pithecus laetus* Elliot, 1909: Malaysia, West Malaysia, P. Tinggi.
14. *Pithecus bintangensis* Elliot, 1909; Indonesia, P. Bintan: Sungei Biru.
15. *Pithecus impudens* Elliot, 1910; Indonesia, P. Sugi.
16. *Pithecus lingae* Elliot, 1910; Indonesia, P. Lingga.
17. *Pithecus lapsus* Elliot, 1910; Indonesia, P. Bangka: Tanjung Pamuja.
18. *Pithecus lautensis* Elliot, 1910; Indonesia, P. Laut.
19. *Pithecus lingungensis* Elliot, 1910; Indonesia, P. Lagong.
20. *Pithecus sirhassensis* Elliot, 1910; Indonesia, P. Serasan.
21. *Macacus pumilus* Miller, 1900; Indonesia, P. Benua.
22. *Pithecus mandibularis* Elliot, 1910; Indonesia, Borneo, Kalimantan: Sungai Ambawang, near Pontianak.
23. *Pithecus carimatae* Elliot, 1910; Indonesia, P. Karimata: Teluk Pai.

mains, have been collected in caves in Timor and Flores, both of which are east of Wallace's Line (passing between Bali and Lombok). In four carefully excavated caves in Timor, where basal deposits date back to ca. 13.5 Ka, the oldest *M. fascicularis* subfossils do not appear until ca. 4.5 Ka (Glover, 1986, p. 212). At lower levels, the only mammals included among the human food remains are murid rodents and bats, of which thousands of skeletal fragments were collected; these lower levels also yield stone tools. At approximately the same level where *M. fascicularis* first appears, remains of palm civet and cuscus also appear, along with remains of domestic goat, pig, and dog and pottery. Glover (1986, p. 159) concluded that ". . . there is strong presumptive evidence that these species [*M. fascicularis,* palm civet, and cuscus] were introduced into Timor directly by, or through the agency of man, between about 4000–5000 years ago." For *M. fascicularis,* a less plausible alternative hypothesis is that it was present in Timor earlier but was not hunted by the preceramic cave inhabitants, possibly because they lacked suitable projectile weapons (cf. Adi, 1985, p. 65).

In Flores, a subfossil molar of *M. fascicularis* was collected in cave deposits, dated ca. 3.5 Ka, that also contain human artifacts and human skeletal remains. Other mammals represented in these deposits are rat species, fruit bat, porcupine, and pig (Hooijer, 1967, p. 160). Based on available zoogeographic evidence, including Glover's archeological data from Timor (see above), Musser (1981, p. 133) concluded that *M. fascicularis,* porcupine, and pig probably were introduced into Flores by humans.

Systematics

Subspecific Taxonomy

The geographic range of *M. fascicularis* is broad and encompasses mainland Southeast Asia and numerous large and small islands, both on and beyond the Sunda Shelf (Figs. 3, 4). It is therefore not surprising that this species exhibits great individual, local, and geographic variation in a diverse array of characters (see above); variation among populations of *M. fascicularis* ranges from trivial, to statistically significant, to locally discontinuous, to totally discontinuous. Based on this variation, 50 specific or subspecific names have been proposed for populations of this species (Fig. 25). The evaluation of intraspecific variation for the purpose of defining taxonomically useful subspecies presents serious theoretical and practical difficulties, as previously discussed by Chasen (1940a, p. 66; cf. Table 35) in his classic review of *M. fascicularis.*

In the present taxonomic analysis, subspecific status is accorded only to those geographic populations in which variation of at least one character is completely—or nearly completely—discontinuous with variation of the same character in the nominotypical subspecies, *M. f. fascicularis.* The reason for selecting character-state discontinuity as the critical requisite for subspecific recognition is that, without such discontinuity, unambiguous diagnosis of subspecies becomes difficult or impossible. The requirement of character-state discontinuity denies subspecific recognition to local populations that are distinct from adjacent populations of *M. f. fascicularis* but that fall within

←

24. *Macaca resima* Thomas & Wroughton, 1909b; Indonesia, Java: Tasikmalaya.
25. *Macaca modax* Thomas & Wroughton, 1909c; Indonesia, Java: Cilacap.
26. [*Simia*] *Aygula* Linnaeus, 1758; Indonesia, Java.
27. *Pithecus baweanus* Elliot, 1910; Indonesia, P. Bawean.
28. *Pithecus cupidus* Elliot, 1910; Indonesia, P. Matasiri.
29. *Macaca irus submordax* Sody, 1949; Indonesia, P. Bali: Desa Poetjang.
30. *Macaca irus sublimitus* Sody, 1932; Indonesia, P. Sumba: Payeti-Kambaniru and Mao Marroe.
31. *Pithecus fascicularis limitis* Schwartz, 1913; Indonesia, P. Timor: Lelogama.
32. *Cynomolgus cagayanus* Mearns, 1905; Philippines, Cagayan Sulu I.
33. *Cynomolgus suluensis* Meanrs, 1905; Philippines, Jolo I.: foot of Crater Lake Mountain.

M. f. fascicularis/M. f. philippinensis contact zone

34. *Cynomolgus mindanensis apoensis* Mearns, 1905; Philippines, Mindanao I.: Mt. Apo.
35. *Cynomolgus mindanensis* Mearns, 1905; Philippines, Mindanao I.: Pantar.

M. f. philippinensis

36. *Pithecus mindorus* Hollister, 1913; Philippines, Mindoro I.: Alag River.
37. *Macacus palpebrosus* I. Geoffroy, 1851; Philippines, Luzon I.; "fôrets de Manille."
38. *Macacus fur* Slack, 1867; Philippines, Luzon I.

TABLE 34. Summary comparison of external characters in recognized subspecies of *Macaca fascicularis*.[1]

Subspecies[2]	Dorsal pelage color	Crown color	Lateral facial crest pattern[3]	Thigh (outer surface), color	Head and body length,[4] ad. males	Relative tail length,[4] ad. males
aurea	Buffy to medium brown	Golden brown	Infrazyg.	Similar to dors. pel. col.	560 ± 61 520–630 N = 3	95 ± 9 85–104
atriceps	Buffy to medium brown	Dark brown to blackish (narrow)[5]	Transzyg.	Similar to dors. pel. col.	452 ± 17 425–465 N = 5	118 ± 7 110–128
condorensis	Buffy to medium brown	Dark brown to blackish (broad)[5]	Transzyg.	Similar to dors. pel. col.	450 ± 18 435–480 N = 5	115 ± 7 109–127
fascicularis	Buffy to dark brown	Golden brown	Transzyg.	Similar to dors. pel. col.	462 ± 43 370–610 *N* = 193	118 ± 15 69–150 *N* = 189
karimondjawae	Dark grayish brown	Dark brown to diffusely blackish	?	Similar to dors. pel. col.	501 N = 1	108
philippinensis	Dark brown	Dark golden brown	Transzyg.	Similar to dors. pel. col.	480 ± 33 410–530 N = 13	114 ± 9 101–129
tua	Blackish	Yellowish brown	Transzyg.[6]	Brownish gray	440 N = 1	131
umbrosa	Blackish	Yellowish brown	Infrazyg. or transzyg.[7]	Pale brownish gray	502 ± 25 475–525 N = 3	115 ± 1 115–116
lasiae	Blackish	Blackish[8]	Infrazyg. or transzyg.	Similar to dors. pel. col.[9]	470 N = 1	118
fusca	Blackish	Blackish[10]	Infrazyg. or transzyg.	Similar to dors. pel. col.[11]	478 ± 14 460–495 N = 6	97 ± 6 90–105

[1] Abbreviations: ad. = adult; infrazyg. = infrazygomatic; transzyg. = transzygomatic.
[2] Listed in order of increasing pelage color saturation.
[3] See Figure 8.
[4] Entries indicate mean ± SD, extremes, and sample size; relative tail length = tail length/head and body length × 100.
[5] See Figure 7.
[6] Subauricular hairs pale ochraceous-buff, conspicuously elongated.
[7] Subauricular hairs pale brownish, not elongated.
[8] Crown hairs inconspicuously annulated.
[9] Outer surface of shanks pale grayish brown.
[10] Crown hairs conspicuously annulated with pale yellowish.
[11] Outer surface of shanks blackish.

the range of variation of more distant populations of this subspecies. This is not intended to depreciate the theoretical importance of locally deviant populations, which often have great zoogeographic or evolutionary significance (see below); appreciation of this significance does not require formal subspecific recognition.

A total of 10 subspecies of *M. fascicularis* are recognized here (Fig. 25, Table 34, Appendix 12). These are *M. f. fascicularis* (core area, many shallow-water fringing islands, some deep-water fringing islands); *M. f. aurea* (core area northwest of *M. f. fascicularis*, adjacent shallow-water fringing islands); *M. f. atriceps, M. f. condorensis,* and *M. karimondjawae* (shallow-water fringing islands); and *M. f. umbrosa, M. fascicularis fusca, M. f. lasiae, M. f. tua,* and *M. f. philippinensis* (deep-water fringing islands). Characters and distributions of these subspecies are briefly reviewed below and are treated in greater detail in subsequent subspecies accounts.

1. *M. f. fascicularis.* The type locality of *M. fascicularis*—and, hence, of *M. f. fascicularis*—is Bengkulu, southwestern Sumatra, a locality that fortuitously lies within the previously defined core area of distribution of the species. Judging from

available evidence, variation of characters in Sumatra is continuous with that in the Malay Peninsula (including the Isthmus of Kra north to ca. 10°N), Borneo, and Java (see above); all of these parts of the core area are therefore included within the geographic range of *M. f. fascicularis,* as here defined. In the southern part of the Indochinese Peninsula, character-state variation in *M. fascicularis* also is continuous with that in the Malay Peninsula, Sumatra, Borneo, and Java, with the possible exception of variation of mtDNA types (Table 17) and resistance to experimental infections with *Plasmodium knowlesi* malaria (see above; Fooden, 1994, p. 585). Because evidence for discontinuity of variation of mtDNA types and *P. knowlesi* resistance is incomplete, the southern part of the Indochinese Peninsula is provisionally retained within the geographic range of *M. f. fascicularis.* Although now disjunct, the range of *M. f. fascicularis* in the southern part of the Indochinese Peninsula was connected by dry land to the range of this subspecies in the Malay Peninsula during the last glacial maximum, ca. 18 Ka (Fig. 3).

In most shallow-water fringing-island populations of *M. fascicularis,* variation is continuous with that in core-area *M. f. fascicularis* (Appendixes 3–9; Fooden & Albrecht, 1993, p. 537); therefore, these islands are included within the geographic range of *M. f. fascicularis.* In eight of these shallow-water fringing-islands, populations are distinct from nearby core-area populations of *M. f. fascicularis* but fall within the range of variation of more distant populations of this subspecies; as indicated above, these populations are not recognized here as separate subspecies, although some have been recognized as subspecies by other authors. These eight populations, sorted according to characters that distinguish the fringing-island populations from nearby core-area populations of *M. f. fascicularis,* inhabit the following islands: P. Mursala (west of Sumatra), P. Redang (east of the Malay Peninsula), P. Lagong (west of Borneo), and P. Uwi (west of Borneo)—distinguished by dorsal pelage erythrism (Appendix 4); P. Tioman (east of the Malay Peninsula) and P. Belitung (west of Borneo)—distinguished by T and/or relative T (Appendixes 8, 9); and Ko Kut and Phu Quoc Dao (both south of the Indochinese Peninsula)—distinguished by skull length (Fooden & Albrecht, 1993, p. 528). In many other fringing-island populations, character-state variation is statistically significantly different from, but continuous with, variation in nearby core-area populations (Appendixes 3–9); some of these populations also have been recognized as separate subspecies by other authors.

The deep-water fringing-island population of *M. fascicularis* in P. Nias (west of Sumatra) resembles the eight shallow-water fringing-island populations listed above in being distinct—in tail coloration and T—from nearby core-area populations of *M. f. fascicularis* in Sumatra but falling within the range of variation of more distant populations of this subspecies. Although the proximodorsal surface of the tail is more intensely blackish in P. Nias than in Sumatra, as emphasized by Miller (1903b, p. 63) in his description of the P. Nias monkey as *Macacus phaeura,* tail coloration in *M. fascicularis* in P. Nias broadly overlaps that in specimens collected in other parts of the species range (cf. MCZ 36030, USNM 121871—P. Nias; USNM 196823—Kalimantan; MCZ 37415—Sabah; USNM 124710—P. Bangka; USNM 124969, 124970—P. Belitung). T and relative T in P. Nias similarly overlap T and relative T in other parts of the species range (Figs. 15, 17; Appendixes 8, 9). Lacking character-state discontinuity, *M. fascicularis* in P. Nias is regarded here as subspecifically inseparable from *M. f. fascicularis.* Deep-water fringing-island populations of *M. fascicularis* in the Lesser Sundas and southern Philippines are retained within *M. f. fascicularis* because known variation in these populations is continuous with that in nearby core-area populations of *M. f. fascicularis* (Appendixes 3–5, 7–9; Fooden, 1991, p. 21; Fooden & Albrecht, 1993, p. 537).

2. *M. f. aurea.* In the western part of the Indochinese Peninsula and western part of the Isthmus of Kra south to about 10°N, variation of the lateral facial crest pattern (infrazygomatic) is almost completely discontinuous with variation of this character (transzygomatic) in the rest of the core area (Figs. 8, 9). This warrants recognition of the subspecies *M. f. aurea* (type locality, Pegu, southern Burma). In all samples available from shallow-water islands in the Mergui Archipelago, west of the northern part of the Isthmus of Kra, the lateral facial crest pattern also is infrazygomatic; these islands are therefore included within the geographic range of *M. f. aurea.*

Two areas immediately east of the range of *M. f. aurea* are heterogeneous for the lateral facial crest pattern (Fig. 9). The more southern of these two areas, in eastern and southern parts of the Isthmus of Kra and adjacent southwestern islands, may be regarded as an intersubspecific contact zone between the ranges of *M. f. fascicularis* and *M. f.*

TABLE 35. Subspecies of *Macaca fascicularis* recognized as valid by Chasen (1940a) and recent authors; dash (—) indicates that subspecies is extralimital in the cited work.

Subspecies	Author and date						
	Chasen (1940a)	W. C. O. Hill (1974)	P. H. Napier (1981)	Scott (1982)	Groves and Weitzel (1988)[1]	Fa 1989	This paper
argentimembris	×	×	×	×		×	
atriceps	×[2]	×	×	×		×	×
aurea	×[3]	×	×			×	×
baweana	×	×	×	×	—	×	
bintangensis				×	×		
cagayana	—	×		—	—		
capitalis	×	×	×			×	
condorensis	×[2]	×	×		×[3]		×
cupida	×	×	×	—	—	×	
fascicularis (= *irus*)	×	×	×	×	×	×	×
fusca	×	×	×	—	—	×	×
impudens				×	—		
karimondjawae		×	×	×	—		×
laeta	×	×	×	×	×	×	
lasiae	×			—	—	×	×
limitis	—	×	×	×	—	×	
lingungensis				×	×		
mandibularis				×	×		
mindanensis	—			—	—	×	
mindora	—			—	—	×	
mordax	×	×	×	×	×	×	
phaeura	×	×	×	—	×[3]	×	
philippinensis	—	×	×	—	—	×	×
pumila	×	×	×	×	—	×	
sirhassensis				×	×		
sublimitis	—	×	×		—	×	
submordax				×	—		
tua				—	—	×	×
umbrosa	×[2]	×	×	—	—	×	×
valida	—	×	×		×[3]	×	
Subsp. (Borneo, north)				×	×		
Subsp. (P. Banggi)				×			
Subsp. (P. Siantan)				×			

[1] In Weitzel et al. (1988, pp. 5, 96).
[2] Subspecies recognized, name not applied.
[3] Subspecies recognized provisionally.

aurea. The more northern of these two areas, in central and eastern parts of the Indochinese Peninsula, along the northern margin of the species range, may be either an intersubspecific contact zone between the ranges of *M. f. fascicularis* and *M. f. aurea* or an interspecific contact zone between the ranges of *M. fascicularis* and *M. mulatta* (cf. Fooden, 1971, p. 24); future study of variation in *M. mulatta* may contribute to resolution of this ambiguity.

3. *M. f. atriceps*. The distinctive narrow dark crown patch warrants recognition of this subspecies in shallow-water Ko Khram Yai in the Gulf of Thailand (Fig. 7, Table 5, Appendix 5).

4. *M. f. condorensis*. The distinctive broad dark crown patch warrants recognition of this subspecies in shallow-water Con Son and nearby Hon Ba, both in the South China Sea (Fig. 7, Table 5, Appendix 5).

5. *M. f. karimondjawae*. Variation of dorsal pelage color saturation in the population of *M. fascicularis* in P. Karimunjawa and presumably also in nearby P. Kemujan, both shallow-water islands north of Java, overlaps minimally with that in *M. f. fascicularis* (Appendix 3). The dark grayish brown dorsal pelage color of this population is the basis for recognition of *M. f. karimondjawae*.

6. *M. f. umbrosa*. The population of *M. fascicularis* in the Nicobar Islands, northwest of Su-

matra, is one of four deep-water fringing-island populations with distinctively blackish dorsal pelage (Appendix 3). The crown is yellowish brown and the thighs are pale brownish gray in *M. f. umbrosa.*

7. *M. fascicularis fusca.* In the population of *M. fascicularis* in deep-water P. Simeulue, west of Sumatra, the back, crown, and thighs are blackish, and the tail is shorter than usual in *M. fascicularis* (Figs. 16, 18; Appendixes 3, 8, 9).

8. *M. f. lasiae.* In the population in deep-water P. Lasia, near P. Simeulue, the back, crown, and thighs are blackish, as in *M. fascicularis fusca,* but the tail is of normal length (Figs. 16, 18, 27; Appendixes 3, 8, 9).

9. *M. f. tua.* In the population in deep-water P. Maratua, east of Borneo, the back is blackish, the crown is yellowish brown, and the thighs are brownish gray (Appendix 3). In *M. f. tua,* unlike *M. f. umbrosa,* subauricular hairs are elongated and pale ochraceous-buff.

10. *M. f. philippinensis.* In populations of *M. fascicularis* in western, northern, and eastern islands of the Philippine Archipelago, dorsal pelage color is distinctively dark brown (Appendix 3; Fooden, 1991, p. 3). In eastern and central Mindanao, southern Negros, and perhaps in some nearby islands, mixed populations of dark and pale individuals occur; this area of mixed populations is regarded as a contact zone between *M. f. philippinensis* and *M. f. fascicularis.*

Brief casual remarks have been published concerning dorsal pelage coloration in *M. fascicularis* in P. We, a deep-water island off the northern tip of Sumatra (Scheffrahn et al., 1994, p. 136). These remarks are inadequate for determination of the subspecific status of this population.

The present subspecific classification of *M. fascicularis* differs from recent classifications proposed by W. C. O. Hill (1974, p. 504), R. H. Napier (1981, p. 12), Scott (1982, unpubl. M.A. thesis, p. 182), Weitzel et al. (1988, p. 96), and Fa (1989, p. 54) (Table 35). P. H. Napier, whose list of subspecies follows that of W. C. O. Hill with a single exception (nonrecognition of subspecies *cagayana* Mearns, 1905), explicitly acknowledges that her classification is unsatisfactory and that many of the recognized subspecies cannot be diagnosed. Scott's classification is based on a sample of 148 specimens (including 134 skins and 69 skulls), more than 90% of which are in two museums (MZB, ZRC); this sample, which apparently is almost identical with that studied by Chasen (1940a, p. xix), provides an inadequate representation of variation in *M. fascicularis.* Weitzel et al. indicate that their classification is largely based on Scott's research. Fa, without further explanation or documentation, lists 21 subspecies of *M. fascicularis* that he recognizes as valid; most, but not all, of these subspecies are the same as those recognized by authors cited above.

Key to Recognized Subspecies

The 10 subspecies of *Macaca fascicularis* recognized here are distinguished in the following key, which is based on external characters of postinfants:

1. General color of dorsal surface of trunk buffy to yellowish gray to medium brown to dark brown, variably erythristic 2
   General color of dorsal surface of trunk blackish 7
2. Preauricular hairs directed posteriorly, partly covering ears (lateral facial crest infrazygomatic) ..... *aurea*
   Preauricular hairs directed anteriorly, forming part of lateral facial crest, not covering ears (lateral facial crest transzygomatic) 3
3. General color of dorsal surface of trunk buffy to yellowish gray to medium brown, variably erythristic 4
   General color of dorsal surface of trunk dark brown,[1] variably erythristic 6
4. Crown conspicuously darker than back 5
   Crown not conspicuously darker than back ..... *fascicularis*

[1] Note: Approximately 5% of *M. f. fascicularis* specimens examined are dark brown and, if of unknown geographic origin, probably would be misidentified as either *M. f. karimondjawae* or *M. f. philippinensis.*

5. Dark crown patch narrow, extending laterally approximately as far as middle of each eye, sharply delimited laterally and posteriorly ..... *atriceps*
   Dark crown patch broad, extending laterally to or beyond lateral margin of each eye, not sharply delimited laterally and posteriorly ..... *condorensis*
6. Pale annulations of dorsal hairs pale yellowish ..... *karimondjawae*
   Pale annulations of dorsal hairs golden to rufescent ..... *philippinensis*
7. Outer surface of thighs blackish, approximately same color as dorsal surface of trunk 8
   Outer surface of thighs brownish gray, contrastingly paler than dorsal surface of trunk 9
8. Outer surface of shanks blackish; tail length < 112% of head and body length ..... *fusca*
   Outer surface of shanks pale grayish brown; tail length > 112% of head and body length ... *lasiae*
9. Subauricular hairs pale ochraceous-buff, elongated (4–6 cm), extending to apex of lateral facial crest forming a conspicuous pale lateral facial patch; tail length > 122% of head and body length ... *tua*
   Subauricular hairs brownish gray to pale gray, not elongated (2–4 cm), not extending to apex of lateral facial crest, relatively inconspicuous; tail length < 122% of head and body length ..... *umbrosa*

Subspecies Accounts

Macaca fascicularis fascicularis

(Raffles, [1821], p. 246)

Jawanska Markattor: Osbeck, 1757, p. 99—external characters and behavior of monkeys collected and observed in Java by P. Osbeck, Jul. 1751; specimens not preserved.

[*Simia*] *Aygula* Linnaeus, 1758, p. 27—based on Jawanska Markattor: Osbeck, 1757, and supplementary information in unpublished letters from Osbeck to Linnaeus (P. H. Napier & Groves, 1983, p. 117). Thomas & Wroughton, 1909a, p. 373—misidentified as a species of leaf monkey. P. H. Napier & Groves, 1983, p. 118—shown to be a senior synonym of *Macaca fascicularis* (Raffles, [1821]); suppression requested. International Commission on Zoological Nomenclature, 1986, p. 229—specific name officially suppressed.

[*Cercopithecus*] *aygula:* Erxleben, 1777, p. 39—external and cranial characters.

Cercop[*ithecus*] *Aigula:* Schinz, 1821, p. 108—incorrect spelling of [*Simia*] *Aygula* Linnaeus, 1758. Schinz, 1825, p. 256—said to be indistinguishable from *Inuus cynamolgus* [= *Macaca fascicularis*].

Macaca aygula: Daudin in Lacepède & Daudin, [1802], p. 148—listed as "Variété A" of *Macaca cynomolgus* [= *M. fascicularis*].

Pithecus aygula: É. Geoffroy, 1803, p. 24—external characters.

Cercocebus aygula: É. Geoffroy, 1812, p. 99—external characters.

Macaque: Buffon in Buffon & Daubenton, 1766, p. 190, pls. 20, 22–24—based on specimen of unknown origin, not preserved; species said to inhabit "Congo & des autres parties de l'Afrique méridionale." F. Cuvier, 1819, liv. 3, p. 1, 2 pls.—illustrations of captives designated as *Irus* by F. Cuvier, 1818; habitat, "vraisemblablement du Sénégal ou de la côte de Guinée."

Aigrette: Buffon in Buffon & Daubenton, 1766, p. 190, pl. 21—based on specimen of unknown origin, not preserved; regarded as "variété" of Macaque: Buffon in Buffon & Daubenton, 1766.

Simia Cynamolgos: Schreber, [1774], p. 91, pl. 13 (part; not Linnaeus, 1758, p. 28)—misidentification of Macaque: Buffon in Buffon & Daubenton, 1766. Schlegel, 1876, p. 101—name said to have been based on misidentification. Blanford, [1888a], p. 624—name said to have been based on misidentification.

Cercopithecus (*Cynamolgus*): Zimmermann, 1780, p. 186 (part; not Linnaeus, 1758, p. 28)—misidentification of Macaque: Buffon in Buffon & Daubenton, 1766.

Cercocebus cynamolgos: Schlegel, 1876, p. 101 (not Linnaeus, 1758)—taxonomic comparisons.

[*Cercopithecus*] *Cynomolgus:* Erxleben, 1777, p. 28 (part; not Linnaeus, 1766, p. 38)—misidentification of Macaque: Buffon in Buffon & Daubenton, 1766.

Simia Cynomolgus: Audebert, 1798–1799, p. 5 (part; not Linnaeus, 1766, p. 38)—misidentification of Macaque: Buffon in Buffon & Daubenton, 1766.

Simia cynomolgos: G. Cuvier, 1798, p. 98—incorrect spelling of [*Simia*] *Cynomolgus:* Linnaeus, 1766; misidentification of Macaque: Buffon in Buffon & Daubenton, 1766.

Macaca cynomolgus: Daudin in Lacepède & Daudin, [1802], p. 148 (not Linnaeus, 1766)—misidentification of Macaque: Buffon in Buffon & Daubenton, 1766.

[*M*]*acacus cynomolgus:* Desmarest, 1820, p. 65 (part; not Linnaeus, 1766)—misidentification of Macaque: Buffon in Buffon & Daubenton, 1766. Blanford, 1888b, pp. 21, 23—binomial said to be based on misidentification, accepted as valid.

Macacus '*cynomolgus*' Auct.: Miller, 1900, p. 239—specimens collected in P. Lingga and P. Tioman. Miller, 1903a, p. 476—specimens collected at Teluk Tapanuli, Sumatra, and in P. Tuangku and P. Mursala.

Cyn[*ocephalus*] *cynomolgus:* Latreille, 1804, p. 292 (part; not Linnaeus, 1766, p. 38)—misidentification of Macaque: Buffon in Buffon & Daubenton, 1766.

Cercocebus cynomolgus: É. Geoffroy, 1812, p. 99 (not Linnaeus, 1766)—external and cranial characters.

[*P*]*ithecus cynomolgus:* Desmarest, 1817, p. 323 (part; not Linnaeus, 1766, p. 38)—misidentification of Macaque: Buffon in Buffon & Daubenton, 1766.

Pithecus Cynomolgos: Blainville, [1839], pl. 7—incorrect spelling of [*Simia*] *Cynomolgus:* Linnaeus, 1766.

Pith[*ecus*] (*Mac*[*acus*]) *cynomolgus:* Dahlbom, 1856, p. 118 (not Linnaeus, 1766, p. 38)—external characters.

I[*nuus*] *cynomolgus:* Wagner, [1839], p. 135 (not Linnaeus, 1766, p. 38)—external characters; distribution; taxonomic comparisons.

Irus: F. Cuvier, 1818, p. 120—unavailable name, not published in combination with generic name; proposed as substitute specific technical name for Macaque: Buffon in Buffon & Daubenton, 1766 (cf. I. Geoffroy, 1826, p. 588; [1831], p. 56: Gervais, 1854, p. 85; Miller, 1942, p. 127); habitat "vraisemblablement du Sénégal ou de la côte de Guinée" (corrected to "du midi de l'Asie, et particulièrement de Sumatra" by F. Cuvier, 1825, liv. 52, p. 1).

Simia fascicularis Raffles, [1821], p. 246—for details concerning holotype, see below. Cantor, 1846, p. 176—cited as a synonym of *Cercopithecus cynomolgus.* H. C. Robinson, 1916, p. 63—type locality restriction.

Semn[*nopithecus*]? *fascicularis:* [Vigors], 1830, p. 642—geographic distribution; type history; "doubtful whether it is a true *Semnopithecus.*"

Semnopithecus fascicularis?: Waterhouse, 1838, p. 4—geographic distribution.

S[*emnopithecus*] *fascicularis:* Martin, 1838, p. 435—external characters.

Macacus fascicularis: Bonhote, 1903, p. 3—taxonomic history.

Macaca fascicularis: Miller, 1906b, p. 65—specimens collected in P. Karimata. Wroughton, 1918, p. 556—taxonomic history. Hooijer, 1962b, p. 44—subspecific taxonomy.

Macaca fascicularis group: Thomas, 1928, p. 832—specimens collected in Vietnam.

[*Cynomolgus*] *fascicularis:* Trouessart, 1904, p. 16—geographic distribution.

Pithecus fascicularis: Elliot, 1913, p. 233—taxonomic comparison.

[*Silenus*] *fascicularis:* Stiles & Nolan, 1929, p. 529—parasites.

P[*ithecus*] *f*[*ascicularis*] *fascicularis:* Schwarz, 1913, p. 297—taxonomic comparison.

M[*acaca*] *fascicularis fascicularis* J. R. Napier & Napier, 1967, p. 403—geographic distribution.

Macaca mulatta fascicularis: Fooden, 1964, p. 364—taxonomic comparison.

Kra Buku: Raffles, [1821], p. 247—vernacular name of "smaller species" than *Simia fascicularis* Raffles, [1821], p. 246 [apparently juvenile *Macaca fascicularis*], specimens apparently not obtained; habitat, Sumatra and "other Malay islands."

Macacus irus I. Geoffroy, 1826, p. 588—based on Macaque: Buffon in Buffon & Daubenton, 1766, and living captives reported by F. Cuvier (1818, p. 112; 1819, liv. 3, p. 1); specimens not preserved, origin unknown; binomial incorrectly attributed to F. Cuvier, 1818. I. Geoffroy, [1831], p. 56—cited as a synonym of *Macacus cynomolgus* Desmarest, 1820; taxonomic history. Blanford, [1888a], p. 624—taxonomic history. Cabrera, 1910, p. 620—taxonomic history; type locality, Sumatra. H. C. Robinson & Kloss, 1914, p. 394—type locality, probably Malacca (= Melaka). Miller, 1942, p. 127—cited as a synonym of *Macaca fascicularis* (Raffles, [1821]); binomial attributed to Blanford, [1888a]. Fooden, 1976, p. 226—cited as a synonym of *Macaca fascicularis* (Raffles, [1821]); binomial attributed to I. Geoffroy, 1826.

Macaca irus: H. C. Robinson & Kloss, 1915a, p. 130—specimens collected in Ko Samui and Ko Phangan.

[*Macaca*] *irus*-group: Miller, 1933, pp. 5, 6—taxonomic history.

[*Macaca*] *ira:* Weinman & Wiratmadja, 1969, p. 498—trypanosomes.

Pithecus irus: Elliot, 1913, p. 229—taxonomic comparison.

[*Silenus*] *irus:* Stiles & Nolan, 1929, p. 530—parasites.

Cynomolgus irus: Furuya, 1962, p. 377—dermatoglyphics.

Macaca irus irus: H. C. Robinson & Kloss, 1918, p. 6—collected in Sumatra; taxonomic history. Chasen, 1940a, p. 66—taxonomic comparisons. Kellogg, 1945, pp. 116, 129—taxonomic comparisons. Sody, 1949, p. 130—taxonomic comparison.

Carbonarius: F. Cuvier, 1825, liv. 52, p. 2, pl.—unavailable name, not published in combination with generic name; based on living captive, origin unknown; specimen not preserved.

Macacus carbonarius I. Geoffroy, 1826, p. 588—based on *Carbonarius:* F. Cuvier, 1825; external characters; taxonomic comparison. Lesson, 1827, p. 42—said to inhabit Sumatra. I. Geoffroy, [1831], p. 63—doubtfully distinct. Eydoux & Souleyet [& Gervais], 1841, p. 6—cited as a synonym of *Macacus aureus* I. Geoffroy, [1831] [= *Macaca fascicularis aurea*]. Blyth, 1875, p. 7—cited as a synonym of *Macacus cynomolgus* [= *Macaca fascicularis*].

S[*imia*] *carbonaria:* Fischer, 1829, p. 26—habitat, Sumatra.

C[*ynamolgus*] *carbonarius:* Reichenbach, 1862, p. 136—taxonomic comparison.

Semnopithecus kra Lesson, [1830], p. 20—replacement name for *Simia fascicularis* Raffles, [1821], p. 246.

Semnopithecus Buku Martin, 1838, p. 435—specific name proposed provisionally for Kra Buku: Raffles, [1821], p. 247. J. Anderson, 1879, p. 74—cited as a synonym of *Macacus cynomolgus* [= *Macaca fascicularis*].

Inuus cercopithecus Mason, 1851, p. 220—unavailable name attributed to Blyth, cited in synonymy, never treated as available.

Macacus cancrivorus Mason, 1851, p. 221—unavailable name attributed to Blyth, cited in synonymy, never treated as available.

C[*ynamolgus*] *cynocephalus:* Reichenbach, 1862, p. 133 (not Linnaeus, 1766, p. 38)—natural history.

Macacus assamensis: Gray, 1870, p. 31 (not McClelland in Horsfield, [1840], p. 148)—misidentification; taxonomic comparison.

Macacus Sinicus: Morice, 1875, p. 41 (not Linnaeus, 1771, p. 521)—misidentification of monkeys observed in Vietnam.

Macacus pumilus Miller, 1900, p. 241—holotype, USNM 101639, adult male, skin and skull, collected at Pulo Bunoa (= Pulau Benua), Kepulauan Tambelan, Indonesia, by W. L. Abbott, 6 Aug. 1899; paratypes, USNM 101638 (juvenile female, P. Benua, 5 Aug.), USNM 101666 (adult female, P. Uwi, 13 Aug.), and USNM 101711 (subadult male, P. Siantan, 8 Sep.), skins and skulls, collected in Indonesia by W. L. Abbott, 1899. Lyon & Osgood, 1909, p. 284—holotype cataloged. Weitzel et al., 1988, p. 112—topoparatypic specimens (P. Siantan) referred to *M. fascicularis sirhassensis* (Elliot, 1910).

[*Cynomolgus*] *pumilus:* Trouessart, 1904, p. 16—distribution.

Pithecus pumilus: Elliot, 1913, p. 252—external and cranial characters.

Macaca irus pumilus: Chasen & Kloss, 1928b, p. 29—taxonomic comparison.

Macaca irus pumila: Chasen, 1940a, p. 69—geographic distribution. Poole & Schantz, 1942, p. 245—holotype cataloged. Weitzel et al., 1988, pp. 111, 113—cited as name previously applied to specimens referred to *M. fascicularis lingungensis* (Elliot, 1910) and *M. f. sirhassensis* (Elliot, 1910).

M[*acaca*] *f*[*ascicularis*] *pumila:* J. R. Napier & Napier, 1967, pp. 349, 403—geographic distribution.

Macacus phaeura Miller, 1903a, p. 63—holotype, USNM 121870 (Coll. No. 2399), adult male, skin and skull, collected at Teluk Siaba, P. Nias, Indonesia, by W. L. Abbott, 20 Mar. 1903; paratypes, USNM 121868 (Coll. No. 2393, adult male, 16 Mar.), USNM 121869 (Coll. No. 2395, adult female, 18 Mar.), and USNM 121871 (Coll. No. 2400, adult male, 20 Mar.), skins and skulls, collected at Teluk Siaba, P. Nias, Indonesia, by W. L. Abbott, 1903. Lyon & Osgood, 1909, p. 284—holotype cataloged.

Macaca phaeura: Lyon, 1906, p. 606—specimens collected in P. Bangka and P. Belitung. Miller, 1942, p. 128—specimens collected in P. Nias.

Pithecus phaeurus: Elliot, 1913, p. 243—external and cranial characters.

Pithecus phaeura: Lyon, 1916, p. 458—geographic distribution.

Macaca irus phaeura: Chasen, 1940a, p. 69—geographic distribution. Poole & Schantz, 1942, p. 245—holotype cataloged.

M[*acaca*] *f*[*ascicularis*] *phaeura:* J. R. Napier & Napier, 1967, pp. 349, 403—geographic distribution.

Cynomolgus suluensis Mearns, 1905, p. 430—holotype, USNM 125324 (Coll. No. 5750), adult male, skull only, collected at foot of Crater Lake Mountain, Jolo I., Philippine Islands, by E. A. Mearns, 16 Nov. 1903. W. C. O. Hill, 1974, p. 522—cited as a synonym of *Macaca irus philippinensis* I Geoffroy, [1843]. Fooden, 1991, p. 22—cited as a synonym of *Macaca fascicularis fascicularis* (Raffles, [1821]).

Macaca suluensis: Lyon & Osgood, 1909, p. 284—holotype cataloged.

Macaca suluana: Alcasid, [1970], p. 24—incorrect spelling of *Cynomolgus suluensis* Mearns, 1905.

Macaca sulvensis: Chiarelli, 1972, p. 213—incorrect spelling of *Cynomolgus suluensis* Mearns, 1905.

[*Macacus*] *suluensis:* Raven, 1935, p. 237—geographic distribution.

Pithecus suluensis: Hollister, 1912, p. 37—listed. Elliot, 1913, p. 252—specific status indeterminate.

M[*acaca*] *p*[*hilippinensis*] *suluensis:* Rabor, 1986, p. 138—geographic distribution.

Cynomolgus cagayanus Mearns, 1905, p. 431—holotype, USNM 125325 (Coll. No. 5771), adult male, skin and skull, collected in Cagayan Sulu I., Philippine Islands, by E. A. Mearns, 25 Feb. 1904. P. H. Napier, 1981, p. 13—cited as a synonym of *Macaca fascicularis philippinensis* I. Geoffroy, [1843]. Fooden, 1991, p. 22—cited as a synonym of *Macaca fascicularis fascicularis* (Raffles, [1821]).

Macaca cagayana: Lyon & Osgood, 1909, p. 283—holotype cataloged. Poole & Schantz, 1942, p. 241—holotype cataloged.

[*Macacus*] *cagayanus:* Raven, 1935, p. 236—geographic distribution.

Pithecus cagayanus: Hollister, 1912, p. 36—geographic distribution.

Macaca irus cagayana: W. C. O. Hill, 1974, p. 525—external and cranial characters.

M[*acaca*] *p*[*hilippinensis*] *cagayanus:* Rabor, 1986, p. 138—geographic distribution.

Cynomolgus fuscus: Moszkowski, 1909, pp. 143, 302 (not Miller, 1903a, p. 476)—misidentification of specimens collected in Sumatra.

Pithecus validus Elliot, 1909, p. 252—holotype, BM(NH) 1881.6.30.2, adult male, skin and skull, collected in "Cochin China," Vietnam, by M. Boucard, before 1882.

Macaca validus: Kloss, 1919c, p. 348—taxonomic comparison.

M[*acaca*] *i*[*rus*] *validus:* Kloss, 1921, p. 75—taxonomic comparison.

Macaca irus valida: Kellogg, 1945, p. 119—geographic distribution.

M[*acaca*] *f*[*ascicularis*] *valida:* J. R. Napier & Napier, 1967, pp. 349, 403—geographic distribution. P. H. Napier, 1981, pp. 13, 19—external characters; holotype cataloged.

Macaca fascicularis validus: Van Peenen et al., 1971, p. 134 (part)—female specimens collected at Sontra Peak; geographic variation.

Pithecus alacer Elliot, 1909, p. 253—holotype, BM(NH) 1909.4.1.36 (Coll. No. 1454), adult male, skin and skull, collected at Bliah (= Selatbliat), P. Kundur, Kepulauan Riau, Indonesia, by H. C. Robinson and E. Seimund, 18 Aug. 1908; paratype (available but not explicitly cited in original description), BM(NH) 1909.4.1.37 (Coll. No. 1495, adult female, skin and skull), collected at Selatbliat, P. Kundur, Indonesia, by H. C. Robinson and E. Seimund, 20 Aug. 1908. H. C. Robinson & Kloss, 1914, pp. 393, 394—type history. Chasen, 1925, p. 93—cited as a synonym of *Macaca irus* F. Cuvier (I. Geoffroy, 1826). Chasen, 1940a, p. 66—cited as a synonym of *Macaca irus irus* F. Cuvier (I. Geoffroy, 1826). P. H. Napier, 1981, pp. 13, 15—cited as a synonym of *Macaca fascicularis fascicularis* (Raffles, [1821]); holotype cataloged.

[*Macacus*] *alacer:* Raven, 1935, p. 236—geographic distribution.

M[*acaca*] *i*[*rus*] *alacer:* Dammerman, 1926b, p. 316—geographic distribution.

Pithecus karimoni Elliot, 1909, p. 254—holotype, BM(NH) 1909.4.1.34 (Coll. No. 1662), adult male, skin and skull, collected at Monos, P. Karimun, Kepulauan Riau, Indonesia, by H. C. Robinson and E. Seimund, 30 Aug. 1908; paratype, BM(NH) 1909.4.1.35 (Coll. No. 1636, adult female, skin and skull), collected at Monos, P. Karimun, Indonesia, by H. C. Robinson and E. Seimund, 29 Aug. 1908. H. C. Robinson Kloss, 1914, p. 393, 394—type history; taxonomic comparison. Chasen, 1925, p. 93—cited as a synonym of *Macaca irus* F. Cuvier (I. Geoffroy, 1826). Chasen, 1940a, p. 66—cited as a synonym of *Macaca irus irus* F. Cuvier (I. Geoffroy, 1826). P. H. Napier, 1981, pp. 13, 15—cited as a synonym of *Macaca fascicularis fascicularis* (Raffles, [1821]); holotype cataloged.

[*Macacus*] *karimoni:* Raven, 1935, p. 236—geographic distribution.

M[acaca] i[rus] karimoni: Dammerman, 1926b, p. 316—geographic distribution.

Pithecus laetus Elliot, 1909, p. 255—holotype, BM(NH) 1909.4.1.21 (Coll. No. 849), subadult male, skin and skull, collected in P. Tinggi, West Malaysia, by H. C. Robinson, 25 Jun. 1908; paratype (available but not explicitly cited in original description), BM(NH) 1909.4.1.27 (Coll. No. 844, juvenile female, skin and skull), collected in P. Tinggi, by H. C. Robinson, date unspecified, presumably Jun. 1908. Elliot, 1913, p. 236—geographic distribution, P. Tinggi and P. Tioman, West Malaysia. H. C. Robinson & Kloss, 1914, p. 393—type history; taxonomic comparisons.

Macaca laetus: Kloss, 1911a—taxonomic comparison.

[*Macacus*] *laetus:* Raven, 1935, p. 236—geographic distribution.

Macaca irus laetus: H. C. Robinson, 1919, p. 325—zoogeography.

Macaca irus laeta: Chasen, 1940a, p. 69—geographic distribution.

Macaca fascicularis laeta: Medway, 1966, p. 16—natural history. P. H. Napier, 1981, pp. 13, 18—external characters; holotype cataloged.

M[acaca] f[ascicularis] laeti: J. R. Napier & Napier, 1967, pp. 349, 403—geographic distribution.

Pithecus dollmani Elliot, 1909, p. 256—holotype, BM(NH) 1909.4.1.20 (Coll. No. 1065), late subadult male, skin and skull, collected at Changi, Singapore I., by H. C. Robinson and E. Seimund, 22 Jul. 1908 (cf. P. H. Napier, 1981, p. 15). H. C Robinson & Kloss, 1914, p. 393—type history. Kloss, 1919c, p. 347—taxonomic comparison. Chasen, 1924b, p. 59—taxonomic comparison. Chasen, 1940a, p. 66—cited as a synonym of *Macaca irus irus* F. Cuvier (I. Geoffroy, 1826). P. H. Napier, 1981, pp. 13, 15—cited as a synonym of *Macaca fascicularis fascicularis* (Raffles, [1821]); holotype cataloged.

[*Macacus*] *dollmani:* Raven, 1935, p. 236—geographic distribution.

[*Macaca irus*] *dollmani:* Sody, 1949, table 1—external and cranial characters.

Pithecus bintangensis Elliot, 1909, p. 257—holotype, BM(NH) 1909.4.1.23 (Coll. No. 812), adult male, skin and skull, collected at Sungei Biru, P. Bintan, Kepulauan Riau, Indonesia, by H. C. Robinson, date unspecified, presumably Jun. 1908; paratypes, BM(NH) 1909.4.1.24 (Coll. No. 780, adult female, Sungei Biru, P. Bintan, 11 Jun.), BM(NH) 1909.4.1.25 (Coll. No. 784, subadult female, Sungei Biru, P. Bintan, 12 Jun.), BM(NH) 1909.4.1.26 (Coll. No. 746, adult female, Pasir Panjang, P. Bintan, 8 Jun.), and BM(NH) 1909.4.1.29 (Coll. No. 870, adult female, Tanjong Sauh, P. Batam, 10 Jun.), skins and skulls, collected in Kepulauan Riau, Indonesia, by H. C. Robinson and/or E. Seimund, 1908. Elliot, 1913, p. 246—type series information. Robinson & Kloss, 1914, pp. 393, 394—type history; taxonomic comparison. H. C. Robinson, 1916, p. 62—cited as a synonym of *Pithecus fascicularis* (Raffles, [1821]). Chasen, 1924b, p. 59—cited as a synonym of *Macaca irus* F. Cuvier (I. Geoffroy, 1826). Chasen, 1940a, p. 66—cited as a synonym of *Macaca irus irus* F. Cuvier (I. Geoffroy, 1826). P. H. Napier, 1981, pp. 13, 15—cited as a synonym of *Macaca fascicularis fascicularis* (Raffles, [1821]); type history.

[*Macacus*] *bintangensis:* Raven, 1935, p. 236—geographic distribution.

M[acaca] i[rus] bintangensis: Dammerman, 1926b, p. 316—geographic distribution.

M[acaca] f[ascicularis] bintangensis: Groves & Weitzel in Weitzel et al., 1988, pp. 5, 96, 99—external characters; geographic distribution.

Macaca mordax Thomas & Wroughton, 1909c, p. 380—holotype, BM(NH) 1909.1.5.27 (Coll. No. 613), subadult male, skin and skull, collected at Tjilatjap (= Cilacap), sea level, W Java, Indonesia, by G. C. Shortridge, 19 Oct. 1907; paratype, BM(NH) 1909.1.5.28 (Coll. No. 783, juvenile female, skin and skull), collected at Cilacap, sea level, W Java, Indonesia, by G. C. Shortridge, 12 Nov. 1907 (cf. Thomas & Wroughton, 1909a, p. 373). Miller, 1933, p. 8—possible physiological differentiation.

[*Macacus*] *mordax:* Raven, 1935, p. 236—geographic distribution.

Pithecus mordax: Elliot, 1913, p. 232—geographic distribution; external and cranial characters.

P[ithecus] f[ascicularis] mordax: Schwarz, 1913, p. 296—taxonomic comparison.

Macaca fascicularis mordax: Hooijer, 1962b, p. 46—cranial characters; taxonomic comparisons. P. H. Napier, 1981, pp. 13, 18—external characters; holotype cataloged.

Macaca irus mordax: Dammerman, 1928, p. 300—specimens collected in Sumba; taxonomic comparisons. Sody, 1929, p. 165—included in fauna of Java. Sody, 1933, p. 93—specimens collected in Bali; taxonomic comparisons. Mertens, 1936, p. 315—specimens collected in Bali, Lombok, Sumbawa, and Flores; taxonomic comparisons. Sody, 1949, p. 131—specimens collected in Java; taxonomic comparisons.

Macaca resima Thomas & Wroughton, 1909c, p. 381—holotype, BM(NH) 1909.1.5.31 (Coll. No. 1219), late subadult male, skin and skull, collected at Tasikmalaja (= Tasikmalaya), 1145 ft (= 350 m), Preanger (region), W Java, Indonesia, by G. C. Shortridge, 18 Jan. 1908. Dammerman in Chasen, 1940a, pp. 68, 70—cited as a synonym of *Macaca irus mordax* Thomas & Wroughton, 1909c. P. H. Napier, 1981, pp. 13, 18—cited as a synonym of *Macaca fascicularis mordax* Thomas & Wroughton, 1909c; holotype cataloged.

[*Macacus*] *resimus:* Raven, 1935, p. 237—geographic distribution.

Pithecus resimus: Elliot, 1913, p. 224—external and cranial characters; taxonomic comparison.

Pithecus lapsus Elliot, 1910, p. 343—holotype, USNM 124863 (Coll. No. 3418), adult male, skin and skull, collected at Tanjung Pamuja, P. Bangka, Indonesia, by W. L. Abbott, 19 Jun. 1904; paratypes, USNM 124969 (Coll. No. 3519, adult male, skin and skull fragments, 19 Jul.) and USNM 124970 (Coll. No. 3521, adult male, skin and skull, 20 Jul.), collected at Tanjung Batu, P. Belitung, Indonesia, by W. L. Abbott, 1904. Chasen, 1940a, p. 66—cited as a synonym of *Macaca irus irus* F. Cuvier, 1818 (I. Geoffroy, 1826). Poole & Schantz, 1942, p. 243—holotype cataloged. P. H. Napier, 1981, p. 13—cited as a synonym of *M. fascicularis fascicularis* (Raffles, [1821]).

[*Macacus*] *lapsus:* Raven, 1935, p. 236—geographic distribution.

Macaca irus lapsus: Sody, 1937, p. 247—specimens collected in P. Bangka; external and cranial characters; taxonomic comparison.

Pithecus agnatus Elliot, 1910, p. 344—holotype, USNM

114409 (Coll. No. 1471), adult male, skin and skull, collected in P. Tuangku, Kepulauan Banyak, Indonesia, by W. L. Abbott, 26 Jan. 1902; paratypes, USNM 114408 (Coll. No. 1464, late subadult male, skin and skull, 24 Jan.), USNM 111410 (Coll. No. 1472, adult male, skin and skull, 26 Jan.), USNM 114411 (Coll. No. ?, subadult male, skull only, 28 Jan.), and USNM 114643 (Coll. No. ?, late juvenile male, skull only, 25 Jan.), collected in P. Tuangku, Kepulauan Banyak, Indonesia by W. L. Abbott, 1902. Chasen, 1940a, p. 66—cited as a synonym of *Macaca irus irus* F. Cuvier, 1818 (I. Geoffroy, 1826). Poole & Schantz, 1942, p. 241—holotype cataloged. P. H. Napier, 1981, p. 13—cited as a synonym of *M. fascicularis fascicularis* (Raffles, [1821]).

[*Macacus*] *agnatus:* Raven, 1935, p. 236—geographic distribution.

[*Macaca irus*] *agnatus:* Sody, 1949, Table 1—external and cranial characters.

Pithecus lingungensis Elliot, 1910, p. 344—holotype, USNM 104853 (Coll. No. 492), adult male, skin and skull, collected in Pulo Lingung (= P. Lagong), Kepulauan Natuna, Indonesia, by W. L. Abbott, 19 Jun. 1900. Chasen, 1940a, p. 69—cited as a synonym of *Macaca irus pumila* Miller, 1900. Poole & Schantz, 1942, p. 243—holotype cataloged. P. H. Napier, 1981, p. 14—cited as a synonym of *M. fascicularis pumila* Miller, 1900.

[*Macacus*] *lingungensis:* Raven, 1935, p. 236—geographic distribution.

[*Macaca irus*] *lingungensis:* Sody, 1949, Table 1—external and cranial characters.

M[*acaca*] *f*[*ascicularis*] *lingungensis:* Groves & Weitzel in Weitzel et al., 1988, pp. 5, 96, 99—external characters; geographic distribution.

Pithecus lautensis Elliot, 1910, p. 345—holotype, USNM 104854 (Coll. No. 614), adult male, skin and skull, collected in P. Laut, Kepulauan Natuna, Indonesia, by W. L. Abbott, 9 Aug. 1900. Chasen, 1940a, p. 69—cited as a synonym of *Macaca irus pumila* Miller, 1900. Poole & Schantz, 1942, p. 243—holotype cataloged. P. H. Napier, 1981, p. 14—cited as a synonym of *M. fascicularis pumila* Miller, 1900.

[*Macacus*] *lautensis:* Raven, 1935, p. 236—geographic distribution.

[*Macaca irus*] *lautensis:* Sody, 1949, Table 1—external and cranial characters.

Pithecus sirhassensis Elliot, 1910, p. 345—holotype, USNM 104852 (Coll. No. 468), subadult male, skin and skeleton, collected in Sirhassen I. (= P. Serasan), Kepulauan Natuna, Indonesia, by W. L. Abbott, 8 Jun. 1900. Chasen, 1940a, p. 69—cited as a synonym of *Macaca irus pumila* Miller, 1900. Poole & Schantz, 1942, p. 245—holotype cataloged. P. H. Napier, 1981, p. 14—cited as a synonym of *M. fascicularis pumila* Miller, 1900.

[*Macacus*] *sirhassensis:* Raven, 1935, p. 237—geographic distribution.

[*Macaca irus*] *sirhassensis:* Sody, 1949, Table 1—external and cranial characters.

M[*acaca*] *f*[*ascicularis*] *sirhassensis:* Groves & Weitzel in Weitzel et al., 1988, pp. 5, 96, 99—external characters; geographic distribution.

Pithecus carimatae Elliot, 1910, p. 346—holotype, USNM 125101 (Coll. No. 3646), adult male, skin and skull, collected at Teluk Pai, P. Karimata, Indonesia, by W. L. Abbott, 24 Aug. 1904; paratype (available but not explicitly cited in original description), USNM 125102 (Coll. No. 3661), adult male, skin and skull, collected at Teluk Pai, P. Karimata, Indonesia, by W. L. Abbott, 27 Aug. 1904. Lyon, 1911, p. 137—type history. Chasen, 1935b, p. 2—taxonomic comparison. Chasen, 1940a, p. 66—cited as a synonym of *Macaca irus irus* F. Cuvier, 1818 (I. Geoffroy, 1826). Poole & Schantz, 1942, p. 242—holotype cataloged. P. H. Napier, 1981, p. 13—cited as a synonym of *M. fascicularis fascicularis* (Raffles, [1821]).

[*Macacus*] *carimatae:* Raven, 1935, p. 236—geographic distribution.

[*Macaca irus*] *carimatae:* Sody, 1949, Table 1—external and cranial characters.

Macaca irus? *carimatae:* Sody, 1949, p. 131—specimens collected in P. Pelapis Tengah and P. Serutu, Kepulauan Karimata, Indonesia.

Pithecus mandibularis Elliot, 1910, p. 347—holotype, USNM 142225 (Coll. No. 4196), late subadult male, skin and skull, collected at Sungei Sama (= Sungai Ambawang), near Pontianak, Kalimantan, Indonesia, by W. L. Abbott, 18 Jun. 1905. Lyon, 1911, p. 137—type history. Chasen & Kloss, 1931, p. 10—said to be based on individual variables. Poole & Schantz, 1942, p. 244—holotype cataloged. P. H. Napier, 1981, p. 13—cited as a synonym of *M. fascicularis fascicularis* (Raffles, [1821]).

[*Macacus*] *mandibularis:* Raven, 1935, p. 236—geographic distribution.

Macaca irus mandibularis: Gyldenstolpe, 1920, pp. 3, 14—specimen collected at Kaboerau, Kalimantan, Indonesia; said to be probably "not [valid] as a distinct race." Sody, 1949, p. 130—taxonomic comparison.

[*Macaca irus*] *mandibula:* Sody, 1949, Table 1—incorrect spelling of *Pithecus mandibularis* Elliot, 1910: external and cranial characters.

M[*acaca*] *f*[*ascicularis*] *mandibularis:* Groves & Weitzel in Weitzel et al., 1988, pp. 5, 96, 99—external characters; geographic distribution.

Pithecus baweanus Elliot, 1910, p. 347—holotype, USNM 151829 (Coll. No. 5565), adult male, skin and skull, collected in P. Bawean, Java Sea, Indonesia, by W. L. Abbott, 24 Nov. 1907; paratype (available but not explicitly cited in original description), USNM 151830 (Coll. No. 5566), adult female, skin and skull, collected in P. Bawean, Indonesia, by W. L. Abbott, 24 Nov. 1907. Lyon, 1911, p. 137—type history.

[*Macacus*] *baweanus:* Raven, 1935, p. 236—geographic distribution.

Macaca irus baweana: Chasen, 1940a, p. 70—geographic distribution. Poole & Schantz, 1942, p. 241—holotype cataloged.

Macaca irus baweanus: Sody, 1949, p. 132—specimens collected in P. Bawean; taxonomic comparison.

M[*acaca*] *f*[*ascicularis*] *baweana:* J. R. Napier & Napier, 1967, pp. 349, 403—geographic distribution.

Pithecus cupidus Elliot, 1910, p. 348—holotype, USNM 151831 (Coll. No. 5584), adult male, skin and skull, collected in P. Matasiri, Java Sea, Indonesia, by W. L. Abbott, 8 Dec. 1907; paratype (available but not explicitly cited in original description), USNM 154368 (Coll. No. 6388), adult male, cranium only, collected

in P. Matasiri, Indonesia, by W. L. Abbott, presumably 1907–1908. Lyon, 1911, p. 137—type history.

[*Macacus*] *cupidus:* Raven, 1935, p. 236—geographic distribution.

Macaca irus cupida: Chasen, 1940a, p. 70—geographic distribution. Poole & Schantz, 1942, p. 242—holotype cataloged.

[*Macaca irus*] *cupidus:* Sody, 1949, Table 1—external and cranial characters.

M[*acaca f*[*ascicularis*] *cupida:* J. R. Napier & Napier, 1967, pp. 349, 403—geographic distribution.

Pithecus lingae Elliot, 1910, p. 349—holotype, USNM 101603 (Coll. No. ?), subadult male, skin and skull, collected in Linga I. (= P. Lingga), Kepulauan Lingga, Indonesia, by W. L. Abbott, 23 Jul. 1899; paratype, USNM 101602 (Coll. No. ?), late juvenile male, skin and skull, collected in P. Lingga, Indonesia, by W. L. Abbott, 23 Jul. 1899. Chasen, 1925, p. 93—cited as a synonym of *Macaca irus* F. Cuvier (I. Geoffroy, 1826). Chasen, 1940a, p. 66—cited as a synonym of *Macaca irus irus* F. Cuvier, 1818 (I. Geoffroy, 1826). Poole & Schantz, 1942, p. 243—holotype cataloged. P. H. Napier, 1981, p. 13—cited as a synonym of *M. fascicularis fascicularis* (Raffles, [1821]).

[*Macacus*] *lingae:* Raven, 1935, p. 236—geographic distribution.

M[*acaca*] *i*[*rus*] *lingae:* Dammerman, 1926b, p. 316—geographic distribution.

Pithecus impudens Elliot, 1910, p. 350—holotype, USNM 115675 (Coll. No. 1956), adult male, skin and skull, collected in P. Sugi, Kepulauan Riau, Indonesia, by W. L. Abbott, 24 Aug. 1902. Chasen, 1925, p. 93—cited as a synonym of *Macaca irus* F. Cuvier (I. Geoffroy, 1826). Chasen, 1940a, p. 66—cited as a synonym of *Macaca irus irus* F. Cuvier, 1818 (I. Geoffroy, 1826). Poole & Schantz, 1942, p. 242—holotype cataloged. P. H. Napier, 1981, p. 13—cited as a synonym of *M. fascicularis fascicularis* (Raffles, [1821]).

M[*acaca*] *impudens:* Raven, 1935, p. 236—geographic distribution.

M[*acaca*] *i*[*rus*] *impudens:* Dammerman, 1926b, p. 316—geographic distribution.

Macaca irus? *impudens:* Sody, 1949, p. 129—specimens collected in P. Durian, Kepulauan Riau, Indonesia.

Pithecus capitalis Elliot, 1910, p. 350—holotype, USNM 83271 (Coll. No. ?), adult male, skin and skull, collected at Trong (= Ban Phra Muang, Trang Province), peninsular Thailand, by W. L. Abbott, 7 Mar. 1896; paratype cited in original description, USNM 83272 (Coll. No. ?, adult male, skin and skull), collected in Telibon I. [= Ko Telibong], Thailand, by W. L. Abbott, 27 Feb. 1896; paratypes available but not explicitly cited in original description, USNM 83273 (Coll. No. ?, late juvenile male, skin and skull, Ban Phra Muang, 8 Mar.), USNM 83274 (Coll. No. 122, adult female, skin and skull, Tyching, 19 May), and USNM 83275 (Coll. No. ?, infant, skin and skull, Tyching, 19 May), collected in Trang Province, peninsular Thailand, by W. L. Abbott, 1896. Kloss, 1919c, p. 347—taxonomic comparison. Weitzel et al., 1988, p. 109—cited as a synonym of *Macaca fascicularis bintangensis* (Elliot, 1909).

Macaca capitalis: Gyldenstolpe, 1919, p. 131—geographic distribution.

Macaca irus capitalis: Chasen, 1940a, pp. 68–69—geographic distribution; said to be possibly a junior synonym of [*Pithecus*] *vitiis* Elliot, 1910, p. 346 (= *Macaca fascicularis aurea* I. Geoffroy, [1831]). Poole & Schantz, 1942, p. 241—holotype cataloged.

M[*acaca*] *f*[*ascicularis*] *capitalis:* J. R. Napier & Napier, 1967, pp. 349, 403—geographic distribution.

Macaca irus argentimembris Kloss, 1911a, p. 116—holotype, BM(NH) 1949.426 (Coll. No. 3814, SM [= Selangor Museum] 2068/10), adult male, skin and skull, collected in P. Pinang [2], West Malaysia, by C. B. Kloss, 3 Sep. 1910; paratypes, BM(NH) 1955.1523 (Coll. No. 3491, SM 2069/10, adult female, P. Pinang [2], 3 Sep.), ZRC 4-054 (Coll. No. 3488, SM 2070/10, late subadult male, P. Redang, 2 Sep.), and ZRC 4-055 (Coll. No. 3833, SM 2071/10, late juvenile male, P. Redang, 5 Sep.), skins and skulls, collected in West Malaysia by C. B. Kloss, 1910. J. E. Hill, 1960, p. 31—type history. Weitzel et al., 1988, p. 109—cited as a synonym of *M. fascicularis bintangensis* (Elliot, 1909).

[*Macacus*] *irus argentimembris:* Raven, 1935, p. 236—geographic distribution.

Macaca fascicularis argentimembra: Kloss, 1911a, pp. 177, 181—external and cranial characters; taxonomic comparison; type series information.

Macaca fascicularis argentimembris: J. R. Napier & Napier, 1967, pp. 349, 403—geographic distribution. P. H. Napier, 1981, pp. 13, 16—external characters; holotype cataloged.

Macaca [*nemestrinus*-Gruppe] aff. *adusta:* Elbert, 1912, p. 101 (not Miller, 1906a, p. 559)—misidentification of specimens collected in P. Sumbawa. Schwarz, 1912, p. 304—misidentification of specimens collected in P. Sumbawa.

Pithecus fascicularis aff. *limitis* Schwarz, 1912, p. 304—nomen nudum.

Pithecus fascicularis limitis Schwarz, 1913, p. 296—holotype, ZSBS 1911/2104 (Coll. No. 19), adult male, skin and skull, collected at Lelogama, P. Timor, Indonesia, by C. B. Haniel, 28 May 1911; paratypes, ZSBS 1911/2101 (Coll. No. 15, juvenile male, skin and skull, Fatu Timau, NE, 1200 m, 20 May), ZSBS 1911/2102 (Coll. No. 16, adult female, skin and skull, Lelogama, 22 May), ZSBS 1911/2103 (Coll. No. 17, adult male, skin only, Lelogama, 27 May), ZSBS 1911/2105 (Coll. No. 21, infant male, skin and skull, Lelogama, 29 May), ZSBS 1911/2106 (Coll. No. 22, juvenile male, skin only, Lelogama, 30 May), ZSBS 1911/2107 (Coll. No. 24, infant male, skin only, Lelogama, 3 Jun.), ZSBS 1911/21082 (Coll. No. 63, adult male, skin and skull, Kuatnana, 300 m, 20 Jul.), ZSBS 1911/2109 (Coll. No. 69, adult male, skull only, Bokong, 180 m, 26 Jul.), and ZSBS 1911/2110 (Coll. No. 68, adult male, skin only, Bokong, 180 m, 24 Jul.) collected in P. Timor, Indonesia, by C. B. Haniel, 1911. Schwarz, 1914, p. 117—type series information.

M[*acaca*] *f*[*ascicularis*] *limitis:* J. R. Napier & Napier, 1967, pp. 349, 404—geographic distribution.

[*Macacus*] *irus limitis:* Raven, 1935, p. 236—geographic distribution.

Macaca irus limitis: Kellogg, 1945, p. 119—geographic distribution.

Macaca irus limitus: Sody, 1949, p. 133, Table 1—incorrect spelling of *Pithecus fascicularis limitis* Schwarz, 1913; taxonomic comparison.

Pithecus mansalaris Lyon, 1916, p. 452—holotype, USNM

114560 (Coll. No. 1639), adult male, skin and skull, collected in Pulo Mansalar (= P. Mursala), west of Sumatra, Indonesia, by W. L. Abbott, 10 Mar. 1902; paratypes, USNM 114559 (Coll. No. 1624, adult male, skin and skull, 7 Mar.) and USNM 114561 (Coll. No. ?, adult female, skull only, 9 Mar.), collected in P. Mursala, Indonesia, by W. L. Abbott, 1902. Chasen, 1940a, p. 66—cited as a synonym of *Macaca irus irus* F. Cuvier, 1818 (I. Geoffroy, 1826). Poole & Schantz, 1942, p. 244—holotype cataloged. P. H. Napier, 1981, p. 13—cited as a synonym of *Macaca fascicularis fascicularis* (Raffles, [1821]).

[*Macacus*] *mansalaris:* Raven, 1935, p. 236—geographic distribution.

[*Macaca irus*] *mansalaris:* Sody, 1949, Table 1—external and cranial characters.

Pithecus sp.: Thomas, 1928, p. 832—misidentification of juvenile male collected at Tay Ninh, Vietnam.

Macaca mulatta: Thomas, 1928, p. 832 (not Zimmermann, 1780, p. 195)—misidentification of specimens (Coll. Nos. 777, 778) collected at Phu Quoc (not Phu-Qui), Vietnam.

Macaca irus sublimitis Sody, 1932, p. 338—based on five specimens, unseen by Sody, reported by Dammerman (1928, p. 300) as *Macaca irus mordax* Thomas & Wroughton, 1909c; type series, MZB 865 (adult female, Kambera [= Payeti-Kambaniru], 26 Mar.), MZB 866 (adult male, Kambera, 27 Mar.), MZB 867 (juvenile male, Mao Marroe, 4 May), MZB 868 (late juvenile female, Mao Marroe, 8 May), and MZB 869 (subadult female, Mao Marroe, 10 May), collected in P. Sumba, Indonesia, by P. F. Franck and/or Denin, 1925.

[*Macaca irus*] *sumbae:* Sody, 1933, p. 94—lapsus for *Macaca irus sublimitis* Sody, 1932.

Macaca irus sublimitus: Sody, 1949, p. 134, Table 1—incorrect spelling of *Macaca irus sublimitis* Sody, 1932; taxonomic comparisons, distinctiveness of subspecies "still waits for thorough confirmation"; geographic distribution; type series information. W. C. O. Hill, 1974, p. 529—recognized provisionally, said to be probably a synonym of *Macaca irus mordax* Thomas & Wroughton, 1909c.

M[acaca] f[ascicularis] sublimitis: J. R. Napier & Napier, 1967, pp. 349, 404—geographic distribution.

Macaca irus submordax Sody, 1949, p. 133, Table 1—holotype, RMNH unnumbered (Coll. No. E85), adult male, skin and skull, collected at Desa Poetjang, G. Agoeng (= Gunung [Mountain] Agung), E Bali, Indonesia, by H. J. V. Sody, date unspecified, apparently 1927–1931; paratypes, RMNH (Coll. No. E34, juvenile male, skin and skull, Sendang), RMNH (Coll. No. E64, adult male, skin and skull, Sendang), RMNH (Coll. No. E74, adult male, skin and skull, Sendang), RMNH (Coll. No. E136, adult male, skull only, Jembrana, Negara district), and RMNH (Coll. No. E139, subadult female, skin and skull, Jembrana, Negara district), collected in Bali, Indonesia, by H. J. V. Sody, apparently 1927–1931; MZB 2001 (Coll. No. 1), adult female, skin and skull, collected at Batu Meringgit, Bali, Indonesia, by P. F. Franck, 8 Oct. 1928; MZB 6521 (Coll. No. 17/92/33, juvenile male), MZB 6522 (Coll. No. 15/93/33, adult male), and MZB 6523 (Coll. No. 16/04/33, adult male), skins and skulls, collected at Banju Wetan, Bali, Indonesia, by J. J. Menden, 18 Jul. 1933; and one unlocated additional female specimen cited by Sody in Table 1. W. C. O. Hill, 1974, p. 525—cited as a synonym of *Macaca irus mordax* Thomas & Wroughton, 1909c. P. H. Napier, 1981, p. 13—cited as a synonym of *Macaca fascicularis mordax* Thomas & Wroughton, 1909c.

Simia mauritius: W. C. O. Hill, 1974, p. 507 (not Griffith, 1821, p. 58; an "entirely black" monkey)—cited as a synonym of *Macaca irus irus.* P. H. Napier, 1981, p. 13—cited as a synonym of *Macaca fascicularis fascicularis.*

HOLOTYPE—Not preserved. *Simia fascicularis* Raffles, [1821] (p. 246) apparently is based on a single specimen, probably an adult female ("The body is about twenty inches long, and the tail a little more. . . . Canines short."). This specimen was part of a collection made in Sumatra for Raffles by P. Diard and A. Duvaucel during the period March 1819–March 1820 (T. S. Raffles in S. Raffles, 1830, pp. 703, 713); the original description of *Simia fascicularis* is included in Raffles's published catalog of this collection. The fate of the holotype is unclear.

Part of the Raffles/Diard/Duvaucel Sumatra collection, possibly accompanied by the manuscript of Raffles's catalog, was sent to England in March 1820, and another, larger part was sent to England in or before June 1820 (T. S. Raffles in S. Raffles, 1830, pp. 440, 447, 453, 715; Watson et al. in S. Raffles, 1830, p. 716). The text of Raffles's catalog was read at a meeting of the Linnaean Society of London on 5 December 1820. Three specimens of *M. fascicularis* (sexes unspecified) sent by Raffles from Sumatra ultimately reached the museum of the Zoological Society of London (Waterhouse, 1838, p. 7; cf. Vigors, 1830, p. 642), and two additional specimens sent by Raffles from Sumatra or Java reached the museum of the East India Company, London (Horsfield, 1851, pp. iii–iv, 17). When these two museums were disbanded—the former in 1852–1860 and the latter in 1879—their collections were transferred to the BM(NH) (Thomas, 1906, pp. 40, 63), but none of Raffles's specimens of *M. fascicularis* are now preserved in the BM(NH) (cf. P. H. Napier, 1981, p. 16).

Another part of the Sumatra collection was transferred by Raffles to Diard and Duvaucel and subsequently was sent to France by Duvaucel in 1820–1821 (T. S. Raffles in S. Raffles, 1830, p. 720; Lacaze, 1856, col. 536). Included in this part of the collection was an adult female specimen of *M. fascicularis* (MNHN 362/233), which coinciden-

tally is a paralectotype of *M. f. aurea* I. Geoffroy, [1831] (see below). This female, however, almost certainly is not the holotype of *Simia fascicularis*; Raffles considered the specimens that he transferred to Diard and Duvaucel to be "duplicates," not the "originals," which he cataloged and sent to England.

TYPE LOCALITY—Sumatra, restricted to "neighbourhood of Bencoolen [= Bengkulu]" by H. C. Robinson (1916, p. 63). Bengkulu, in southwestern Sumatra, was the headquarters of Raffles, Diard, and Duvaucel (cf. Steenis-Kruseman, 1950, p. 425).

DISTRIBUTION (Fig. 25)—The broad geographic range of *M. f. fascicularis* in Southeast Asia includes the following continental and insular components: the southern part of the Indochinese Peninsula (including southern Vietnam, Cambodia, and southern Thailand) and adjacent islands (excluding the Con Son group and Ko Khram Yai); the northeastern part of the Isthmus of Kra; the Malay Peninsula and adjacent islands; Sumatra and adjacent islands (excluding the Nicobar Islands, the P. Simeulue group, Kepulauan Mentawai, and P. Enganno); Borneo and adjacent islands (excluding P. Maratua), Java and adjacent islands (excluding P. Karimunjawa and P. Kemujan); Lesser Sunda Islands from Bali to Timor (excluding P. Komodo and many nearby islets); and the south-central Philippines (including Cagayan Sulu, Sulu Archipelago, and western Mindanao). At the margins of the subspecific range are three intersubspecific or interspecific contact zones, inhabited by mixed-phenotype populations, as follows: (1) central and eastern parts of the Indochinese Peninsula—an intersubspecific contact zone between ranges of *M. f. fascicularis* and *M. f. aurea,* or an interspecific contact zone between ranges of *M. fascicularis* and *M. mulatta*; (2) eastern and southern parts of the Isthmus of Kra and adjacent southwestern islands—an intersubspecific contact zone between ranges of *M. f. fascicularis* and *M. f. aurea*; and (3) eastern and central Mindanao, southern Negros, and possibly nearby islands—an intersubspecific contact zone between ranges of *M. f. fascicularis* and *M. f. philippinensis* (see below, *M. f. aurea*—Distribution; *M. f. philippinensis*—Distribution).

DIAGNOSIS—General color of dorsal surface of trunk buffy to yellowish gray to medium brown (825 of 868 postinfantile specimens examined), occasionally dark brown (43 specimens; cf. Table 1, Appendix 3); erythrism variable, pale hair annulations pale yellowish to golden to rufescent (cf. Table 3, Appendix 4); crown same color as back, or brighter (847 of 873 postinfantile specimens examined), occasionally with an indistinct blackish wash (24 specimens), rarely contrastingly darker than back (2 specimens; cf. Table 5, Appendix 5); preauricular hairs directed anteriorly, forming part of lateral facial crest (crest transzygomatic, 501 of 504 specimens examined), rarely directed posteriorly, partly covering ears (crest infrazygomatic, 2 specimens; crest asymmetric, 1 specimen; cf. Table 6, Appendix 6); T 67–150% of HB in 311 adult specimens examined (cf. Table 10, Appendix 9).

REMARKS—For comments on nine quasi-distinct populations that are here included within *M. f. fascicularis,* see above (Subspecific Taxonomy).

SPECIMENS EXAMINED—Total, 1,550: skins and skulls, 739; skins only, 285; skulls only, 526 (see Appendix 1).

Macaca fascicularis aurea
I. Geoffroy, [1831], p. 58

Macacus aureus I. Geoffroy, [1831], pp. 58, 76, pl. 2—for details concerning type series, see below. Eydoux & Souleyet [& Gervais], 1841, p. 6, pl. 2—taxonomic comparisons. I. Geoffroy, [1843], p. 566—taxonomic history. Gray, 1849, p. 4—cited as a synonym of *Macacus cynomolgus* [= *Macaca fascicularis*]. I. Geoffroy, 1851, p. 27—taxonomic comparison; type series information. Blyth, 1875, p. 7—cited as a synonym of *Macacus cynomolgus* [= *Macaca fascicularis*]; said to be based on "a casual individual variety from Pegu." J. Anderson, 1879, p. 73—cited as a synonym of *Macacus cynomolgus* [= *Macaca fascicularis*]; type said to be probably a market specimen. Elliot, 1913, p. 229—cited as a synonym of *Pithecus irus* [= *Macaca fascicularis*]. Rode, 1938, p. 223—cited as a synonym of *Macaca irus* (F. Cuvier, 1818; I. Geoffroy, 1826); holotype cataloged.

Macacus auratus Müller, [1840], p. 49 (not É. Geoffroy, 1812, p. 93)—incorrect spelling of *Macacus aureus* I. Geoffroy, [1831]. Blyth, 1863, p. 9—cited as a synonym of *Macacus carbonarius* F. Cuvier (I. Geoffroy, 1826).

I[nuus] aureus: Wagner, [1839], p. 138 (part)—external characters.

Pith[ecus] (Mac[acus]) aureus: Dahlbom, 1856, p. 118—external characters.

Macaca irus aurea: Pocock, 1939, p. 79—taxonomic comparison; type locality restricted to Pegu.

[Macaca irus] aureus: Sody, 1949, Table 1—external and cranial measurements.

M[acaca] f[ascicularis] aurea: J. R. Napier & Napier, 1967, pp. 349, 403—distribution.

Cercopithecus Cynosurus: Helfer, 1838, p. 858 (not Scopoli, 1786, p. 44)—misidentification; natural history.

M[acacus] cynomolgus (?): Blyth, 1844, pp. 474, 476 (not Linnaeus, 1766, p. 38)—specimens collected in Arakan.

Macacus cynomolgus: Blyth, 1875, p. 7 (part; not Linnaeus, 1766)—taxonomic comparisons.

M[acacus] carbonarius: Blyth, 1847, p. 732 (not I. Geoffroy, 1826)—said to be common in Arakan.

C[ynamolgus] mulatta: Reichenbach, 1862, p. 136 (part; not Zimmermann, 1780, p. 195)—misidentification; taxonomic history.

Pithecus vitiis Elliot, 1910, p. 346—holotype, USNM 124176 (Coll. No. 3076), subadult male, skin and mandible (cranium lost Jan. 1938), collected at Domel I. (= Letsok-aw Kyun), Mergui Archipelago, Burma, by W. L. Abbott, 26 Jan. 1904; paratypes, USNM 104442 (Coll. No. 287, late juvenile male, Sullivan's I. [= Lanbi Kyun], 30 Jan.) and USNM 111898 (Coll. No. 757, adult female, St. Matthews I. [= Zadetkyi Kyun], 9 Dec.), skins and skulls, collected in Mergui Archipelago, Burma, by W. L. Abbott, 1900. Pocock, 1939, p. 79—cited as a synonym of *Macaca irus aurea.* Chasen, 1940a, p. 68—said to be possibly a senior synonym of *Pithecus capitalis* Elliot, 1910, p. 350 (= *M. fascicularis fascicularis* (Raffles, [1821])). P. H. Napier, 1981, p. 13—cited as a synonym of *Macaca fascicularis aurea.*

Macaca vitiis: Poole & Schantz, 1942, p. 246—holotype cataloged.

[*Macaca irus*] *vitiis:* Sody, 1949, Table 1—external and cranial measurements.

Pithecus fascicularis: Wroughton, 1915, p. 699 (part; not Raffles, [1821], p. 246)—taxonomic history.

TYPE SERIES—*Macacus aureus* I. Geoffroy, [1831, pp. 58, 76] is explicitly based on four specimens of *Macaca fascicularis*: (1) MNHN 362/234, Type Cat. No. 58a (lectotype, designated by Rode, 1938, p. 223), subadult or adult male, mounted skin only (skull measured by Elliot, 1913, p. 231; reported absent by Rode, 1938, p. 223), obtained in "Bengale" (now partly in eastern India and partly in Bangladesh) by L. T. Leschenault de la Tour, presumably in 1819–1820, acquired by the MNHN in Jul. 1822 (cf. Leschenault de la Tour, 1820, p. 359; 1822, p. 262; I. Geoffroy, 1851, p. 27; Rode, 1938, p. 223; Steenis-Kruseman, 1950, p. 321); (2) unpreserved specimen (not listed in catalog of I. Geoffroy, 1851, p. 27), sex unspecified, obtained in "Pégou" (= Pegu, Burma) by A. A. M. Reynaud, 1827–1828 (cf. de Rossel et al., 1829, p. 603; de Rossel, 1829, p. 609); (3) MNHN 362/233, Type Cat. No. 58b, adult female, mounted skin only, obtained in Sumatra (no further locality information available) by A. Duvaucel, 1819–1820, acquired by the MNHN 7 Sep. 1821 (cf. I. Geoffroy, 1851, p. 27; Rode, 1938, p. 223; de Lacaze, 1856, col. 535); and (4) unpreserved specimen (listed by I. Geoffroy, 1851, p. 29; not listed by Rode, 1938, p. 223), male, skin ("poils usés," I. Geoffroy, [1843], p. 567) with or without skull, obtained in Java (no further locality information available), by P. Diard, 1821. I. Geoffroy ([1831], pp. 58, 76) indicated that dorsal pelage in all four of these specimens was conspicuously erythristic ("Dessus du corps d'un beau roux tiqueté de noir") and cited this as the primary diagnostic character of *Macacus aureus,* "Le Macaque Roux Doré." However, the infrazygomatic lateral facial crest (see above, Pelage) that is now regarded as diagnostic of *Macaca fascicularis aurea* is clearly figured by I. Geoffroy ([1831], Pl. 2) in his illustration of either the "Bengale" or Pegu specimen and is alluded to in his detailed description of the illustrated specimen ("longs poils blancs dirigés en arrière . . . cachent en partie les oreilles," p. 77).

No holotype is designated in the original description of *Macacus aureus* I. Geoffroy, [1831]. In I. Geoffroy's (1851, p. 27) catalog of primates in the MHNH, the "Bengale" specimens ("*L'un des types de l'espèce*") and the Sumatra specimen ("*L'un des types*") are treated as coordinate type specimens of this taxon; the Java specimen is transferred to another taxon (p. 29), and the Pegu specimen is not mentioned. Ambiguous statements by J. Anderson (1879, p. 76) and Elliot (1913, p. 231) may or may not constitute designations of the "Bengale" specimen as lectotype. The "Bengale" specimen is decisively designated as lectotype by Rode (1938, p. 223; cf. International Code of Zoological Nomenclature, 1985, Article 74).

TYPE LOCALITY—Pegu, Burma (restricted by Pocock, 1939, p. 79; cf. International Code of Zoological Nomenclature, 1985, Article 72h). The lectotype of *Macacus aureus* I. Geoffroy, [1831], obtained in "Bengale," probably was a captive purchased in Calcutta (J. Anderson, 1879, p. 76); similar captive specimens in the Calcutta market, or nearby, have been reported by C. Belanger (in I. Geoffroy, [1831], p. 77), Eydoux and Souleyet [& Gervais] (1841, pp. xiv, 6), and J. Anderson (1879, p. 76). The original provenance of the lectotype is unknown. Based on the locality of one of the paralectotypes (see above), Pocock (1939, p. 79) amended the type locality to Pegu.

DISTRIBUTION (Figs. 9, 25)—Southernmost Bangladesh, southwestern and southern Burma (including Preparis I.), adjacent islands in the Mergui Archipelago, and a small area in west-central Thailand; most of the geographic range is west of the mountain chains that form the border between

Burma and Thailand. Adjacent to the geographic range of *M. f. aurea* are two areas—one in central and eastern parts of the Indochinese Peninsula and the other in eastern and southern parts of the Isthmus of Kra—where specimens with the diagnostic lateral facial crest character of *M. f. aurea* and specimens with the diagnostic lateral facial crest character of *M. f. fascicularis* have been collected, sometimes at the same locality. The area in eastern and southern parts of the Isthmus of Kra may be regarded as a *M. f. aurea*/*M. f. fascicularis* contact zone; the area in central and eastern parts of the Indochinese Peninsula may be either a *M. f. aurea*/*M. f. fascicularis* contact zone or a *M. fascicularis*/*M. mulatta* contact zone (see below, Evolution and Dispersal).

DIAGNOSIS—General color of dorsal surface of trunk buffy to medium brown, pale hair annulations pale yellowish to golden, rarely rufescent; crown usually brighter than back, occasionally with an indistinct blackish wash; preauricular hairs directed posteriorly, partly covering ears (lateral facial crest infrazygomatic); T 76–104% of HB in 12 adult specimens examined. For external and cranial measurements, see Table 36.

SPECIMENS EXAMINED—*M. f. aurea,* 53: skins and skulls, 42; skins only, 8; skulls only, 3. Intersubspecific or interspecific contact zones, 45: skins and skulls, 41; skins only, 3; skull only, 1 (see Appendix 1).

Macaca fascicularis philippinensis
I. Geoffroy, [1843], p. 568

For synonymy, see Fooden (1991, pp. 22, 24).

HOLOTYPE—*Macacus philippinesis* I. Geoffroy, [1843, p. 568], is based solely on MNHN 373 (265), albino adult male, mounted skin only (omitted from type catalog published by Rode, 1938, p. 222). This monkey was obtained alive in Manila by A. Chenest and presented by him to the menagerie of the MNHN on 6 Aug. 1841; it died on 29 Aug. 1842 (cf. I. Geoffroy, 1851, p. 29). A figure of the holotype accompanies the original description (pl. 5).

TYPE LOCALITY—Philippine Islands, probably Luzon ("Chenest . . . l'a acquis à Manille, et il le croit originaire de cette île," I. Geoffroy, [1843], p. 570).

DISTRIBUTION (Fig. 25)—Western, northern, and eastern islands of the Philippine Archipelago, including Balabac, Palawan, Culion, Mindoro, Luzon, Samar, Leyte, and probably other islands north of about 10°N (Fooden, 1991, pp. 6, 23). Based on two available skins, northeastern Mindanao formerly was also included in the range of this subspecies (Fooden, 1991, p. 23); however, in June 1991 one of the critical specimens (BM(NH) 1877.10.6.2, Butuan River [= Agusan River]) was discovered to consist of a late infant or early juvenile skin mismatched with a subadult female skull, which weakens the evidence for retaining northeastern Mindanao in the subspecific range. In eastern and central Mindanao, southern Negros, and possibly in nearby islands, between the ranges of *M. f. philippinensis* and *M. f. fascicularis,* is a contact zone inhabited by mixed-phenotype populations.

DIAGNOSIS—General color of dorsal surface of trunk dark brown, pale hair annulations golden to refescent (pale golden in 1 subadult male, FMNH 87718); crown brighter than back (indistinct blackish streak in 1 adult male, BM(NH) 1877.10.6.1); preauricular hairs directed anteriorly, forming part of lateral facial crest (crest transzygomatic); T 101–138% of HB in 14 adult specimens examined. For further details, see Fooden (1991, pp. 3 ff.).

SPECIMENS EXAMINED—*M. f. philippinensis,* 98: skins and skulls, 53; skins only, 15; skulls only, 30. Probably *M. f. philippinensis,* 15: skin only, 1; skulls only, 14. *M. f. philippinensis*/*M. f. fascicularis* contact zone, 110: skins and skulls, 82; skins only, 5; skulls only, 23. Probably *M. f. philippinensis*/*M. f. fascicularis* contact zone, 12: skins and skulls, 2; skin only, 1; skulls only, 9 (see Appendix 1).

Macaca fascicularis umbrosa
Miller, 1902b, p. 789

Cercopithecus cynomolgus: Cantor, 1846, p. 176 (part; not Linnaeus, 1766, p. 38)—Nicobar Islands included in distribution.

Macacus cynomolgus: Barbe, 1846, pp. 365 (not Linnaeus, 1766)—sight records. Blyth, 1846, p. 367 (part)—zoogeography.

M[acacus] cynomolgos: Blyth, 1863, p. 9 (part; not G. Cuvier, 1798, p. 98)—specimen collected in "Nicobars."

Cercocebus carbonarius: Zelebor, [1869], p. 7 (not I. Geoffroy, 1826, p. 588)—cited as "Var. a" of *Inuus cynomolgus*; specimen collected in Great Nicobar I.

M[acacus] carbonarius: J. Anderson, 1881, p. 65 (part;

TABLE 36. *Macaca fascicularis aurea*: external and cranial variation in adult specimens examined.

Locality	Latitude (N)	Adult females HB (mm)	Adult females T/HB × 100	Adult females GL (mm)	Adult males HB (mm)	Adult males T/HB × 100	Adult males GL (mm)
Haungtharaw	16°30′						125.7
Ye Forest	16°10′			108.4			
Wong, 65 km E	15°55′	400	96.3	99.0			
Wong, 85 km E	15°55′	460	76.1	98.5			
Ban Tamrong Phato	14°54′	486	90.7	113.0	529	103.8	128.2
Taungbyauk Chaung	13°45′			116.2			
Kathema Kyun	13°39′						126.3
Kadan Kyun	12°30′				520	95.2	129.8
Mergui	12°26′						128.7
Tenasserim[1]	12°05′	480	95.8	104.4	630	84.9	132.3
		490	94.9	114.0			
		512	94.7	109.1			
Zadetkyi Kyun	9°57′	470	89.4	114.3			
Mean		471.1	91.1	108.54	559.7	94.6	128.50
SD		35.4	7.1	6.62	61.1	9.4	2.41
N		7	7	9	3	3	6

[1] Summary statistics for female sample: HB, mean = 494.0, SD = 16.3; T/HB × 100, mean = 95.1, SD = 0.6; GL, mean = 109.17, SD = 4.80.

not I. Geoffroy, 1826)—cited as "Smaller var." of *Macacus cynomolgus*; external characters of specimen collected in Nicobar Islands.

Macacus umbrosus Miller, 1902b, p. 789—for details concerning type series, see below. Lyon & Osgood, 1909, p. 285—holotype cataloged.

Macaca umbrosa: Miller, 1933, p. 8—possible physiological differentiation. Poole & Schantz, 1942, p. 246—holotype cataloged.

[*Macacus*] *umbrosa:* Raven, 1935, p. 237—geographic distribution.

[*Cynomolgus*] *umbrosus:* Trouessart, 1904, p. 16—geographic distribution.

Pithecus umbrosus: Elliot, 1913, p. 228—external and cranial characters.

[*Silenus*] *umbrosus:* Stiles & Nolan, 1929, p. 537—parasites.

Macaca irus umbrosa: Pocock, 1939, p. 82—external and cranial characters. Kellogg, 1944, p. 76—taxonomic comparisons; zoogeography.

M[*acaca*] *f*[*ascicularis*] *umbrosa:* J. R. Napier & Napier, 1967, pp. 349, 402—geographic distribution.

TYPE SERIES—Holotype (by original designation), USNM 111795 (Coll. No. 888), adult male, skin and skull, collected in Little Nicobar I., Nicobars, India, by W. L. Abbott, 25 Feb. 1901; paratypes, USNM 111796 (Coll. No. 889, subadult male, Little Nicobar I., 26 Feb.), USNM 111797 (Coll. No. 893, adult male, Little Nicobar I., 27 Feb.), USNM 111792 (Coll. No. 918, subadult male, Great Nicobar I., 8 Mar.), USNM 111793 (Coll. No. 929, subadult female, Great Nicobar I., 12 Mar.), USNM 111799 (Coll. No. 939, subadult female, Great Nicobar I., 23 Mar.), USNM 111801 (Coll. No. 886, adult male, Katchall I., 21 Feb.), and USNM 111802 (Coll. No. 887, juvenile male, Katchall I., 21 Feb.), skins and skulls, collected in Nicobars, India, by W. L. Abbott, 1901.

TYPE LOCALITY—Little Nicobar I., Nicobars, India.

DISTRIBUTION (Fig. 25)—Katchall I., Little Nicobar I., and Great Nicobar I., Nicobars, India. Kloss (1903a, p. 114) reported that monkeys are absent in the Nicobars north of Katchall I.

DIAGNOSIS—General color of dorsal surface of trunk blackish (dark brownish gray in 1 adult male, USNM 111801), pale hair annulations pale yellowish; crown yellowish brown, hairs conspicuously annulated with pale yellowish; preauricular hairs directed anteriorly, forming part of lateral facial crest (crest transzygomatic, 5 of 8 specimens examined), or preauricular hairs directed posteriorly, partly covering ears (lateral facial crest infrazygomatic, 3 specimens); subauricular hairs pale brownish gray, not elongated; outer surface of thighs and shanks pale brownish gray; T 115–116% of HB in 3 adult specimens examined. For external and cranial measurements, see Appendixes 7–9 and 12 and Fooden and Albrecht (1993, p. 538).

SPECIMENS EXAMINED—Total 8: skins and skulls, 8 (see Appendix 1).

Macaca fascicularis fusca
Miller, 1903a, p. 476

Macacus fuscus Miller, 1903a, p. 476—for details concerning type series, see below. Lyon & Osgood, 1909, p. 283—holotype cataloged.
Macaca fusca: Thomas, 1923, p. 591—specimen collected in P. Simeulue.
[*Cynomolgus*] *fuscus:* Trouessart, 1904, p. 16—geographic distribution.
Pithecus fuscus: Elliot, 1913, p. 228—external and cranial characters.
Pithecus fuscus fuscus: Lyon, 1916, p. 457—geographic distribution.
Macaca irus fusca: Chasen, 1940a, p. 69—geographic distribution. Poole & Schantz, 1942, p. 242—holotype cataloged. Kellogg, 1944, p. 76—taxonomic comparisons; zoogeography.
M[*acaca*] *f*[*ascicularis*] *fusca:* J. R. Napier & Napier, 1967, pp. 349, 403—geographic distribution.

TYPE SERIES—Holotype (by original designation), USNM 114164 (Coll. No. 1348), adult male, skin and skull, collected at Telok Dalam (= Lhok Dalam), east coast of Simalur I. (= P. Simeulue), Indonesia, by W. L. Abbott, 20 Nov. 1901 (for collecting locality details, see collector's field catalog, USNM); paratypes, USNM 114162 (Coll. No. 1346, adult female, P. Simeulue, 18 Nov. 1901), USNM 114163 (Coll. No. 1347, adult male, P. Simeulue, 18 Nov. 1901), USNM 114165 (Coll. No. 1349, adult female, P. Simeulue, 20 Nov. 1901), USNM 114166 (Coll. No. 1350, adult female, P. Simeulue, 20 Nov. 1901), USNM 114167 (Coll. No. 1354, adult male, P. Simeulue, 26 Nov. 1901), USNM 114168 (Coll. No. 1387, adult male, Sibaboh, P. Simeulue, 17 Dec. 1901), USNM 114169 (Coll. No. 1396, adult male, Labuan Badjan Bay [= Labuhanbajau], P. Simeulue, 1 Jan. 1902), USNM 114247 (Coll. No. 1397, late juvenile male, P. Lasia, 4 Jan. 1902), and USNM 114248 (Coll. No. 1398, adult male, P. Lasia, 5 Jan. 1902), skins and skulls, collected in Indonesia by W. L. Abbott.

TYPE LOCALITY—Telok Dalam (= Lhok Dalam), east coast of Simalur Island (= P. Simeulue), west of northern Sumatra, Indonesia.

DISTRIBUTION (Fig. 25)—P. Simeulue, west of northern Sumatra, Indonesia.

DIAGNOSIS—General color of dorsal surface of trunk blackish, pale hair annulations pale yellowish; crown blackish, hairs conspicuously annulated with pale yellowish; preauricular hairs usually directed posteriorly, partly covering ears (lateral facial crest infrazygomatic, 9 of 13 specimens examined), occasionally directed anteriorly, forming part of lateral facial crest (crest transzygomatic, 4 specimens); subauricular hairs pale gray, not elongated; outer surface of thighs and shanks blackish; T 90–108% of HB in 10 adult specimens examined. For external and cranial measurements, see Table 37, Figures 26 and 27, and Appendix 12.

REMARKS—For comments on T and crown hair annulation in *M. fascicularis fusca,* see below (*M. f. lasiae*—Remarks). Behavior in *M. fascicularis fusca* has been compared with that in Sumatran *M. f. fascicularis* by van Schaik and van Noordwijk (1985a, p. 141) and Sugardjito et al. (1989, p. 197). These authors suggest that sexual dimorphism of size may be less in *M. fascicularis fusca* than in Sumatran *M. f. fascicularis*; however, reduced sexual dimorphism is not apparent in available cranial measurements of *M. fascicularis fusca* (Table 37, Fig. 26).

SPECIMENS EXAMINED—Total, 19: skins and skulls, 12; skins only, 7 (see Appendix 1).

Macaca fascicularis lasiae
(Lyon, 1916, p. 453)

Macacus fuscus: Miller, 1903a, p. 476 (part)—specimens collected in P. Lasia; taxonomic comparisons.
Pithecus fuscus lasiae Lyon, 1916, p. 453—for details concerning type series, see below. W. C. O. Hill, 1974, p. 511—cited as a synonym of *Macaca irus fusca* Miller, 1903a. P. H. Napier, 1981, p. 13—cited as a synonym of *Macaca fascicularis fusca* Miller, 1903a.
Macaca irus lasiae: Chasen, 1940a, p. 69—geographic distribution. Poole & Schantz, 1942, p. 242—holotype cataloged. Kellogg, 1944, p. 76—taxonomic comparisons; zoogeography.

TYPE SERIES—Holotype (by original designation), USNM 114248 (Coll. No. 1398), adult male, skin and skull, collected in P. Lasia, southeast of P. Simeulue, Indonesia, by W. L. Abbott, 5 Jan. 1902; paratype, USNM 114247 (Coll. No. 1397), late juvenile male, skin and skull, collected in P. Lasia, Indonesia, by W. L. Abbott, 4 Jan. 1902. These two specimens also are paratypes of *M. fascicularis fusca* Miller, 1903a, p. 476 (see above; cf. International Code of Zoological Nomenclature, 1985, Article 72d).

TYPE LOCALITY—Palau Lasia, southeast of P. Simeulue, west of northern Sumatra, Indonesia.

DISTRIBUTION (Fig. 25)—Pulau Lasia, west of northern Sumatra, Indonesia.

DIAGNOSIS—General color of dorsal surface of trunk blackish, pale hair annulations pale yellowish; crown blackish, hair annulations inconspicuous; preauricular hairs directed posteriorly, partly covering ears (lateral facial crest infrazygomatic,

TABLE 37. Sexual dimorphism of greatest length of skull (mm) compared in *Macaca fascicularis fusca* and Sumatran *Macaca fascicularis fascicularis* (cf. Fig. 26).

Latitude	Adult females			Adult males			Ratio[1]
	Mean	SD	N	Mean	SD	N	
			M. fascicularis fusca				
2°00′–2°59′N	102.22	2.81	4	121.77	1.88	7	1.19
			Sumatran *M. f. fascicularis*				
5°00′–5°59′S	—	—	0	120.15	4.58	4	—
4°00′–4°59′S	103.10	—	1	120.65	4.96	6	1.17
3°00′–3°59′S	98.35	2.90	2	117.64	3.61	7	1.20
2°00′–2°59′S	103.40	—	1	—	—	0	—
1°00′–1°59′S	94.90	—	1	114.90	—	1	1.21
0°00′–0°59′S	100.25	4.04	4	111.16	1.24	7	1.11
0°00′–0°59′N	—	—	0	119.00	—	1	—
1°00′–1°59′N	95.03	1.82	3	116.27	3.99	3	1.22
2°00′–2°59′N	95.30	0.71	2	115.40	—	1	1.21
3°00′–3°59′N	97.64	2.16	10	115.86	3.42	21	1.19
4°00′–4°59′N	103.40	—	1	120.63	4.92	3	1.17
TOTAL	98.18	3.31	25	116.65	4.39	54	1.19

[1] Male mean divided by female mean.

1 of 2 specimens examined), or directed anteriorly, forming part of lateral facial crest (crest transzygomatic, 1 specimen); subauricular hairs pale grayish brown, not elongated; outer surface of thighs blackish, becoming pale grayish brown on outer surface of shanks; T 118% of HB in 1 adult specimen examined. For external and cranial measurements, see Figure 27 and Appendix 12.

REMARKS—Although *M. f. lasiae,* endemic to P. Lasia, is known from only 2 specimens (1 late juvenile male, 1 adult male), T in these 2 specimens is clearly longer—both relatively and absolutely—than in 13 specimens of *M. fascicularis fusca* (Fig. 27), which inhabits nearby P. Simeulue and which *M. f. lasiae* otherwise strongly resembles; the difference in T was noted previously by Miller (1903a, p. 477) and Lyon (1916, p. 453). Judging from the general pattern of T variation in *M. fascicularis,* the longer tail in *M. f. lasiae* probably is primitive, and the shorter tail in *M. fascicularis fusca* probably is derived (Figs. 16, 18; Appendix 12). Crown hair annulations are less conspicuous in the 2 specimens examined of *M. f. lasiae* than in 13 specimens examined of *M. fascicularis fusca.*

The blackish dorsal pelage of *M. f. lasiae* in deep-water P. Lasia (and *M. fascicularis fusca* in deep-water P. Simeulue) contrasts strikingly with the yellowish brown to golden brown dorsal pelage of *M. f. fascicularis* in shallow-water P. Tuangku (USNM 114408–114410), an island that is only 50 km east of P. Lasia but that is on the Sumatran shelf (Figs. 3, 4). The blackish dorsal pelage of *M. f. lasiae* and *M. fascicularis fusca* also contrasts strikingly with the brownish dorsal pelage of *M. f. fascicularis* in deep-water P. Nias, which is about 95 km southeast of P. Lasia (Appendix 3).

SPECIMENS EXAMINED—Total, 2: skins and skulls, 2 (see Appendix 1).

Macaca fascicularis atriceps
Kloss, 1919c, p. 347

Macaca irus atriceps Kloss, 1919c, p. 347—for details concerning type series, see below. Kloss, 1921, p. 76—external and cranial characters; taxonomic comparisons. Kloss, 1926, p. 358—external and cranial characters; taxonomic comparisons. Poole & Schantz, 1942, p. 243—holotype cataloged. Weitzel et al., 1988, p. 105—cited as a synonym of *Macaca fascicularis bintangensis* (Elliot, 1909) (= *M. f. fascicularis*).

M[acaca] f[ascicularis] atriceps: J. R. Napier & Napier, 1967, pp. 349, 403—geographic distribution.

TYPE SERIES—Holotype (by original designation), USNM 236622 (Coll. No. 2283), adult male, skin and skull, collected in Koh Khram I. (= Ko Khram Yai), near Cape Liant (= Laem Samae San), southeastern Thailand, by C. B. Kloss, 30 Oct. 1916; paratypes, BM(NH) 1939.891 (Coll. No. 2284, adult male), BM(NH) 1939.892 (Coll. No. 2287, adult female), USNM 236618 (Coll. No. 2282,

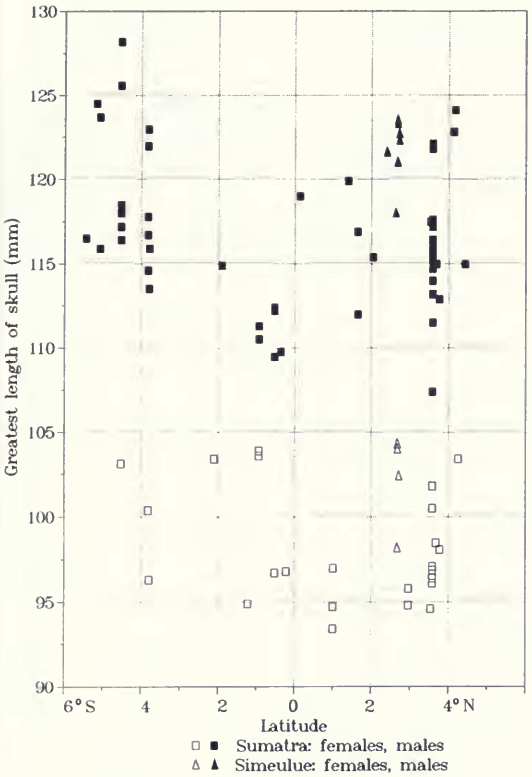

FIG. 26. Variation of greatest length of skull in adult *Macaca fascicularis fusca* (Indonesia: P. Simeulue) compared with variation in adult Sumatran *M. f. fascicularis* (cf. Table 37).

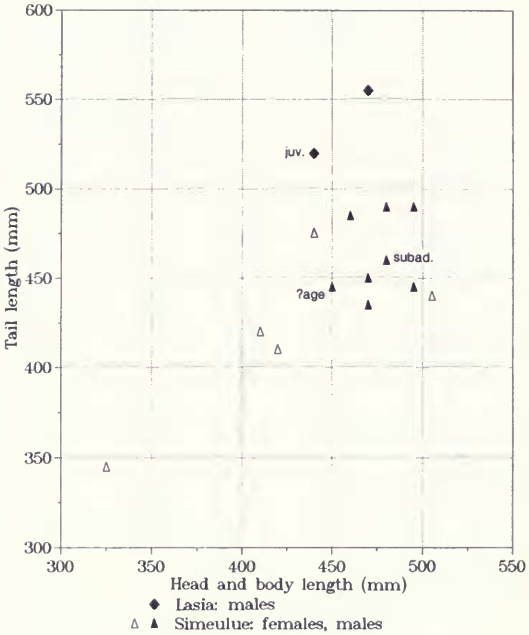

FIG. 27. Tail length vs. head and body length in *Macaca fascicularis fusca* (Indonesia: P. Simeuleu) and *M. f. lasiae* (Indonesia: P. Lasia); specimens are adult, except as otherwise indicated (three specimens).

adult male), USNM 236619 (Coll. No. 2286, adult female), USNM 236620 (Coll. No. 2289, subadult female), USNM 236621 (Coll. No. 2290, juvenile male), ZRC 4-012 (Coll. No. 2288, adult female), ZRC 4-013, skull, and ZRC 4-733, skin (Coll. No. 2285, adult male), skins and skulls, collected in Ko Khram Yai, Thailand, by C. B. Kloss, 30 Oct. 1916.

TYPE LOCALITY—Ko Khram Yai, near Laem Samae San, southeastern Thailand.

DISTRIBUTION (Fig. 25)—Ko Khram Yai, Thailand.

DIAGNOSIS—General color of dorsal surface of trunk buffy to medium brown, pale hair annulations pale yellowish; crown with a narrow, sharply defined dark brown to blackish patch (Fig. 7) that extends laterally as far as middle of each eye and posteriorly as far as vertex or (rarely) occiput; preauricular hairs directed anteriorly, forming part of lateral facial crest (crest transzygomatic); T 109–128% of HB in 9 adult specimens examined. For external and cranial measurements, see Table 38, Figure 28, and Appendix 12.

REMARKS—Kloss (1919c, p. 348; 1921, p. 76; 1926, p. 358) indicated that *M. f. atriceps* differs cranially from *M. f. condorensis* and Indochinese *M. fascicularis* in size of the rostrum, supraorbital ridges, orbits, zygomatic arches, mandible, and molars and in shape of the tooth rows and palate. As evidence, Kloss cited measurements of some of these structures in 9 specimens of *M. f. atriceps* (4 adult females, including 1 young adult regarded by Kloss as a subadult, and 5 adult males) and in 3 specimens of *M. f. condorensis* (1 adult female and 2 adult males); no measurements are cited for specimens of Indochinese *M. fascicularis*.

New data, derived from 5 additional adult specimens of *M. f. condorensis* (1 female, 4 males) and 32 adult specimens of Indochinese *M. fascicularis* (22 females, 10 males), permit reevaluation of the six size characters specified by Kloss (Table 38, Fig. 28). For each of these six cranial characters, size variation in *M. f. atriceps* overlaps that in *M. f. condorensis* and Indochinese *M. fascicularis*. Relative sizes of the rostrum, supraorbital

TABLE 38. Comparison of cranial proportions in Indochinese (I-C) *Macaca fascicularis, M. f. atriceps,* and *M. f condorensis* (cf. Fig. 28; Kloss, 1919c, p. 348; 1921, p. 76; 1926, p. 358).

Population	Adult females				Adult males			
	Mean	SD	Extremes	N	Mean	SD	Extremes	N
Rostral-postrostral ratio (R/PR × 100)								
I-C *M. fascicularis*	49.5	4.6	41.1–56.4	20	60.8	3.1	55.5–65.1	7
M. f. atriceps	51.0	2.8	48.1–54.5	4	58.4	3.6	54.0–63.9	5
M. f. condorensis	50.4	—	46.6–54.1	2	59.8	3.4	55.3–63.3	5
Relative biorbital breadth (BB/GL[1] × 100)								
I-C *M. fascicularis*	51.9	2.7	45.3–55.9	18	50.0	2.1	47.2–54.0	10
M. f. atriceps	51.0	2.1	48.5–53.1	4	50.3	2.2	48.4–53.9	5
M. f. condorensis	48.9	—	48.0–49.7	2	51.2	4.4	46.5–56.8	6
Relative orbital height (OH/GL × 100)								
I-C *M. fascicularis*	20.6	1.7	17.5-24.6	19	18.4	1.1	16.9–20.9	10
M. f. atriceps	19.4	1.1	18.3–20.7	4	17.2	1.3	15.8–19.2	5
M. f. condorensis	21.5	—	20.4–22.5	2	19.1	1.2	17.8–20.6	6
Relative zygomatic breadth (ZB/GL × 100)								
I-C *M. fascicularis*	67.8	2.4	63.2–71.3	22	68.9	1.7	66.4–71.2	10
M. f. atriceps	66.8	2.4	63.1–68.4	4	68.4	2.3	66.8–71.8	4
M. f. condorensis	65.7	—	64.9–66.6	2	67.8	2.6	65.1–71.3	6
Relative mandibular length (ML/GL × 100)								
I-C *M. fascicularis*	73.0	2.1	70.5–77.6	20	75.8	3.1	71.5–81.3	9
M. f. atriceps	72.4	0.5	71.8–72.9	4	75.6	1.6	73.4–77.9	5
M. f. condorensis	73.2	—	72.4–74.0	2	74.9	1.6	72.6–76.4	6
Relative length of maxillary molar row (M1-M3/GL × 100)								
I-C *M. fascicularis*	19.9	1.1	18.2–22.6	22	17.4	0.8	16.2–18.6	10
M. f. atriceps	21.6	0.7	20.9–22.2	4	19.8	1.1	18.9–21.3	5
M. f. condorensis	20.3	—	19.8–20.8	2	18.3	1.4	15.7–19.8	6

[1] Greatest length of skull, excluding incisors.

ridges, zygomatic arches, and mandible are essentially similar in these three populations; relative size of the orbits tends to average smaller in *M. f. atriceps* than in the other two populations, as suggested by Kloss, and relative size of the molars tends to average slightly greater in *M. f. atriceps* than in the other two populations, as also suggested by Kloss.

SPECIMENS EXAMINED—Total 11: skins and skulls, 11 (see Appendix 1).

Macaca fascicularis condorensis
Kloss, 1926, p. 357

monkies: King, 1784, p. 462—said to be abundant in Jan. 1780.

Macaca irus Cuv., subsp.: Kloss, 1921, p. 75—specimens collected in Pulo Condore (= Con Son); taxonomic comparisons.

Macaca irus condorensis Kloss, 1926, p. 357—for details concerning type series, see below. Gibson-Hill, 1949, p. 172—type history. J. E. Hill, 1960, p. 31—type history.

Macaca fascicularis condorensis: Van Peenen et al., 1970 p. 420—specimens collected in Con Son and Hon Ba external and cranial characters. P. H. Napier, 1981 pp. 13, 17—external characters; holotype cataloged.

TYPE SERIES—Holotype (by original designation), BM(NH) 1947.1498 (CBK [C. B. Kloss] No 2691), adult male, skin and skull, collected in Pulo Condore (= Con Son), off Cochin-China (= southern Vietnam), by "Dr. Malcolm Smith's collector," 20 Sep. 1919; paratypes (implicitly cited in original description; explicitly cited by Kloss, 1921 p. 75), BM(NH) 1939.893 (CBK No. 2692, adult male, 23 Sep.) and BM(NH) 1939.894 (CBK No 2693, adult female, 19 Sep.), skins and skulls, collected in Con Son, Vietnam, by "Dr. Malcolm Smith's collector," 1919.

TYPE LOCALITY—Con Son, Vietnam.

DISTRIBUTION (Fig. 25)—Con Son and nearby Hon Ba, two islands in the South China Sea, southeast of southern Vietnam.

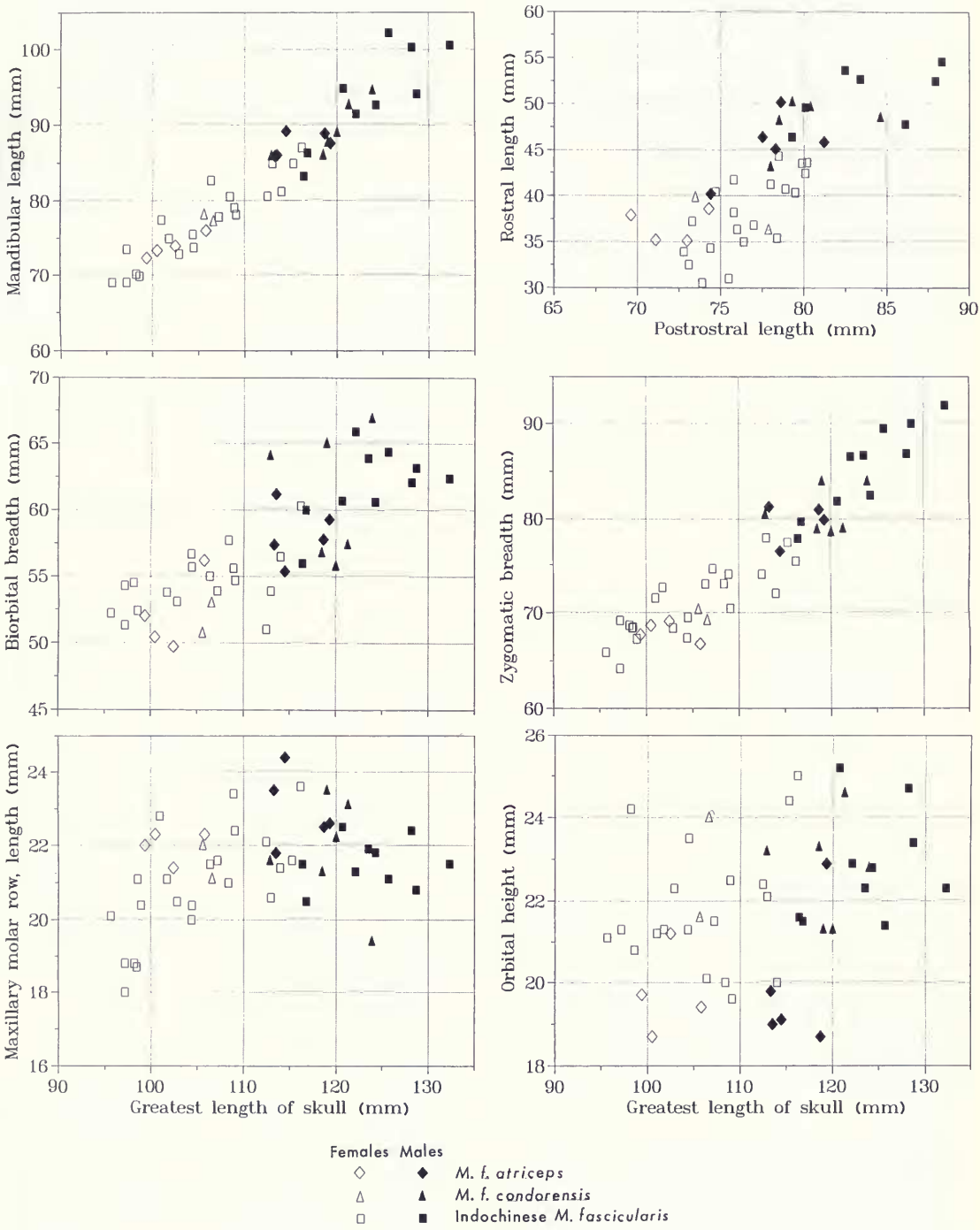

FIG. 28. Craniometric comparisons of adult *Macaca fascicularis atriceps* (Thailand: Ko Khram Yai), *M. f. condorensis* (Vietnam: Con Son), and mainland Indochinese *M. fascicularis* (cf. Table 38).

DIAGNOSIS—General color of dorsal surface of trunk buffy to medium brown (with blackish middorsal streak in 2 juveniles, ZRC 4-017, 4-018), pale hair annulations pale yellowish to golden; crown with a broad dark brown to blackish patch (Fig. 7) that extends laterally as far as lateral margin of each eye and posteriorly as far as vertex or occiput, margin of crown patch not sharply delimited; preauricular hairs directed anteriorly, forming part of lateral facial crest (crest transzygomatic); T 109–127% of HB in 6 adult specimens examined. For external and cranial measurements, see Table 38, Figure 28, and Appendixes 7–9 and 12 and Fooden and Albrecht (1993, p. 537).

REMARKS—See above (*M. f. atriceps*—Remarks).

SPECIMENS EXAMINED—Total, 16: skins and skulls, 11; skins only, 2; skulls only, 3 (see Appendix 1).

Macaca fascicularis tua
Kellogg, 1944, p. 75

Macaca irus tua Kellogg, 1944, p. 75—for details concerning type series, see below. W. C. O. Hill, 1974, p. 507—cited as a synonym of *Macaca irus irus* F. Cuvier, 1818 (I. Geoffroy, 1826). P. H. Napier, 1981, p. 13—cited as a synonym of *Macaca fascicularis fascicularis* (Raffles, [1821]).
M[acaca]f[ascicularis] tua: J. R. Napier & Napier, 1967, pp. 349, 404—geographic distribution.

TYPE SERIES—Holotype (by original designation), USNM 197663 (Coll. No. 626), adult male, skin and skull, collected in Pulo Muara Tua (= P. Maratua), east of Borneo, Kalimantan, Indonesia, by H. C. Raven, 21 May 1913; paratypes, USNM 197660 (Coll. No. 623, juvenile female), USNM 197661 (Coll. No. 624, adult female), and USNM 197662 (Coll. No. 625, subadult male), skins and skulls, collected in P. Maratua, Kalimantan, Indonesia, by H. C. Raven, 21 May 1913.

TYPE LOCALITY—Pulau Maratua, Kalimantan, Indonesia.

DISTRIBUTION (Fig. 25)—Pulau Maratua, east of northeastern Kalimantan, Indonesia.

DIAGNOSIS—General color of dorsal surface of trunk blackish, pale hair annulations pale yellowish; crown pale yellowish brown, hairs conspicuously annulated with pale yellowish; preauricular hairs directed anteriorly, forming part of lateral facial crest (crest transzygomatic); subauricular hairs pale ochraceous-buff, conspicuously elongated; outer surface of thighs brownish gray, becoming pale brownish gray on shanks; T 126–131% of HB in 2 adult specimens examined. For external and cranial measurements, see Appendix 12.

SPECIMENS EXAMINED—Total, 4: skins and skulls, 4 (see Appendix 1).

Macaca fascicularis karimondjawae
Sody, 1949, p. 132

Macacus cynomolgus: Willink, 1905, p. 175 (part, not Linnaeus, 1766, p. 38)—"P. Karimon-Djawa (P. Kamoedian)" included in geographic distribution.
Macaca irus karimondjawae Sody, 1949, p. 132, Table 1—for details concerning type series, see below. W. C. O. Hill, 1974, p. 528—external and cranial characters.
Macaca fascicularis karimondjawae: P. H. Napier, 1981, p. 13—type locality information.

TYPE SERIES—Holotype (by original designation), RMNH 10608 (MZB 2719), adult male, skin and skull, collected in Karimon Djawa (= P. Karimunjawa), Java Sea, Indonesia, by W. Romswinckel, 28 Nov. 1930 (incorrectly given as "28.VI.1930" in original description); paratypes (cf. Sody, 1949, p. 132, Table 1), MZB 1454 (adult male, cranium only, 7 May), MZB 1455 (adult female, skin and skull, 9 May), MZB 1456 (juvenile female, skin and skull, 10 May), MZB 1457 (adult female, skin and skull, 11 May), and MZB 1458 (infant male, skin and skull, 14 May), collected in P. Karimunjawa, Indonesia, by K. W. Dammerman, P. F. Franck, and/or Denin, 1926; MZB 2717 (juvenile male) and MZB 2718 (late juvenile female), skins and skulls, collected in P. Karimunjawa, Indonesia, by W. Romswinckel, 26 Nov. 1930; and MZB 2720 (adult female, cranium only) collected in P. Kemujan, < 1 km northeast of P. Karimunjawa, Indonesia, by W. Romswinckel, 25 Nov. 1930.

TYPE LOCALITY—Karimon Djawa (= P. Karimunjawa), Java Sea, Indonesia.

DISTRIBUTION (Fig. 25)—Pulau Karimunjawa and, presumably, nearby P. Kemujan (known from one cranium only), Java Sea, 60 km north of central Java, Indonesia.

DIAGNOSIS—General color of dorsal surface of trunk dark grayish brown, pale hair annulations pale yellowish; crown frequently with a blackish wash; preauricular hair direction not studied; T 101–112% of HB in 3 adult specimens examined. For external and cranial measurements, see Appendix 12 and Fooden and Albrecht (1993, p. 538).

SPECIMENS EXAMINED—Total 9: skins and skulls, 6; skin only, 1; skulls only, 2 (see Appendix 1).

Macaca fascicularis Subspecies Undetermined

Macacus cristatus Gray, 1870, p. 30—holotype, BM(NH) 1858.4.28.9, late juvenile male, skin (albinistic) and skull, acquired in 1858 from collection of Th. G. van Lidth de Jeude, Utrecht, provenance unknown. Schlegel, 1876, p. 101—cited as a synonym of *Cercocebus cynamolgos:* Schlegel (= *Macaca fascicularis* (Raffles, [1821])). Elliot, 1913, p. 249—cited as a synonym of *Pithecus philippinensis* (I. Geoffroy, [1843]). W. C. O. Hill, 1974, pp. 477, 522—cited as a synonym of *Macaca irus philippinensis* I. Geoffroy, [1843]. P. H. Napier, 1981, pp. 13, 20—cited as a synonym of *Macaca fascicularis philippinenesis* I. Geoffroy, [1843]. Fooden, 1991, p. 24—subspecies not determined; taxonomic history.

Macacus albus: P. H. Napier, 1981, p. 20—unavailable manuscript name, author unknown, written on tag of holotype of *Macacus cristatus* Gray, 1870.

Evolution and Dispersal

Available information concerning the distribution, variation, natural history, and paleontology of *M. fascicularis* provides a basis for hypothetical interpretation of the evolution and dispersal of this species. Because most of the geographic range of *M. fascicularis* is insular, a large part of this interpretation concerns water gaps and their effect on dispersal. Four major factors are pertinent to dispersal in the insular part of the range of *M. fascicularis.*

1. *Eustatic changes in sea level.* Since the beginning of the Pleistocene, ca. 1.75 Ma, worldwide sea level has been strongly controlled by, and inversely correlated with, the cyclic growth of continental glaciers (Van Couvering & Kukla, 1988, p. 459; Heaney, 1991a, p. 56; Cande & Kent, 1992, pp. 13,936, 13,938). Sea level has been approximately as at present since ca. 5 Ka (Clark et al., 1978, p. 283; Fairbanks, 1989, p. 639). It rose sigmoidally to this level from about 120 m lower during the last glacial maximum, ca. 18 Ka, when the Sunda Shelf was exposed and the Indochinese Peninsula, the Malay Peninsula, Sumatra, Borneo, Java, and shallow-water fringing islands were united to form a single large landmass (Fig. 3). During the preceding interglacial, ca. 120 Ka, sea level was high, and components of this large landmass were isolated, approximately as at present. During the penultimate glacial maximum, ca. 160 Ka, sea level was about 160 m lower than at present, thereby adding some deep-water fringing islands to the temporarily consolidated large Sunda Shelf landmass. Similar cyclic sea-level changes, of imprecisely known magnitude, have occurred with a periodicity of ca. 100 Ka since the beginning of the Pleistocene.

Tectonic forces also have affected the distribution of land and sea within the range of *M. fascicularis.* Prominent examples of such effects are the approximately 500-m uplift of the north coast of P. Sumba (Pirazzoli et al., 1991, p. 1835), the approximately 500-m subsidence and subsequent reelevation of P. Maratua (Kuenen, 1947, p. 8), and the massive volcanic explosions of Rakata (= Krakatau) and Toba (Dammerman, 1948, p. 4; Chesner et al., 1991, p. 200; Rampino & Self, 1993, p. 269). However, the zoogeographic implications of Pleistocene tectonic changes in this area are more localized than those of Pleistocene eustatic changes.

2. *Swimming.* The swimming distance limit of *M. fascicularis* probably is about 100 m (see above, Natural History).

3. *Natural rafting.* Monkeys may be transported across water gaps on floating trees or larger entwined masses of vegetation (cf. Wallace, 1895, p. 74). The tendency for *M. fascicularis* to exploit coastal habitats (see above, Natural History) makes this species a prime candidate for such passive dispersal on natural rafts. A specific instance is reported by Hickson (1889, p. 190): "Some days after the eruption of Krakatoa in 1883 a female green monkey [*M. fascicularis*] was found floating on some drifting timber in the Sunda Straits. She was terribly scorched, but completely recovered, and is, I believe, still alive."

The average surface current speed in the Sunda Shelf area is about 1 km/hr (E. G. W. Smith, 1974, Fig. 2.3-1; Couper, 1989, p. 50). Arbitrarily assuming that some members of a small group of *M. fascicularis* could survive on a natural raft for up to about 3 days, such a group potentially could colonize a new island about 75 km distant from its original habitat; during monsoons and other storms, the current would be stronger and the distance covered would be greater. The reproductive capability of a small group of *M. fascicularis* individuals to multiply and populate islands not previously inhabited by this species is demonstrated by the success of introduced populations in Mauritius and Angaur (Poirer & Smith, 1974, p. 264; Sussman & Tattersall, 1986, p. 30).

TABLE 39. Hypothetical stages in evolution and dispersal of *Macaca fascicularis*.

Stage I, ≥ 1 Ma
Dispersal of *M. fascicularis* into Sunda Shelf area.

Stage II, ca. 160 Ka
Dispersal and isolation of progenitors of strongly differentiated deep-water fringing-island populations.
M. f. umbrosa: Nicobar Islands
M. f. fusca, M. f. lasiae: Simeulue and Lasia
M. f. tua: Maratua
M. f. philippinensis: western, northern and eastern Philippines

Stage III, > 18 Ka
Differentiation of progenitors of populations in the Indochinese Peninsula and northern part of the Isthmus of Kra.
M. f. aurea: Indochinese Peninsula, Isthmus of Kra, Mergui Archipelago
M. f. fascicularis: Indochinese Peninsula, Isthmus of Kra

Stage IV, ca. 18 Ka
Dispersal and isolation of progenitors of weakly differentiated deep-water fringing-island populations.
M. f. fascicularis: Nias
M. f. fascicularis: southern Philippines

Stage V, < 18 Ka
Isolation of progenitors of shallow-water fringing-island populations and populations in Penida and Lombok (deep-water).
M. f. karimondjawae: Karimunjawa, Kemujan
M. f. atriceps: Khram Yai
M. f. condorensis: Con Son, Hon Ba
M. f. fascicularis: other shallow-water fringing islands, excluding Bali
M. f. fascicularis: Bali, Penida, Lombok

Stage VI, ca. 4.5 Ka
Dispersal and isolation of progenitors of populations in eastern Lesser Sunda Islands (deep-water).
M. f. fascicularis: Sumbawa-Timor

4. *Transport by humans.* Interisland transport of captive *M. fascicularis* by humans is reported by Wallace (1869, p. 294) and presumably has a long, if undocumented, history in Southeast Asia. *Homo erectus* reached Java by 1–2 Ma, and *H. sapiens* reached Borneo and Australia by ca. 40 Ka (Bellwood, 1985, pp. 29, 89, 98; cf. Swisher et al., 1994, p. 1119). Although much of the dispersal of hominids in the Sunda Shelf area probably occurred over dry land during glacial periods of low sea level, the dispersal of *H. sapiens* to Australia must have been over water, which implies that some means of over-water transport was available to humans in this area at least 40 Ka (cf. Sondaar et al., 1994, p. 1261).

Available evidence indicates a minimum of six major stages in the evolution and dispersal of *M. fascicularis* (Table 39). These are discussed below.

Stage I, ≥ 1 Ma

The earliest record of *M. fascicularis* is at Trinil, east-central Java, ca. 1 Ma (Table 33); the Trinil fossils are part of the Dubois collection that also includes *Homo erectus* and two species of leaf monkeys, *Presbytis comata* and *Trachypithecus auratus* (Hooijer, 1962b, p. 5; Theunissen et al., 1990, p. 41; Groves, 1993, p. 273). Assuming that *M. fascicularis, H. erectus,* and leaf monkeys dispersed to Java from mainland Southeast Asia, they probably reached Java by dry land during one of the Early Pleistocene periods of glacial advance and low sea level (cf. J. de Vos et al., 1994, p. 131).

The earliest record of *M. nemestrina* also is in east-central Java but is somewhat later (ca. 800 Ka) than that of *M. fascicularis* (Table 33). Despite this later date, zoogeographic evidence indicates that *M. nemestrina* probably preceded *M. fascicularis* in the Sunda Shelf area (Fooden, 1975, p. 70). *Macaca fascicularis* is absent in Sulawesi and Kepulauan Mentawai, faunistically distinctive islands off the Sunda Shelf that are inhabited by *M. nemestrina* or its close relatives. Since *M. fascicularis* is otherwise much more widely distributed than *M. nemestrina* and its relatives (Fooden, 1980, p. 4), it appears that the intrinsic ability of *M. fascicularis* to disperse is not inferior to that of *M. nemestrina.* This suggests that the *M. nemestrina* stock dispersed from the Sunda Shelf to Sulawesi and Kepulauan Mentawai at some time prior to 1 Ma, before *M. fascicularis* had arrived on the Sunda Shelf.

During Late Pleistocene or Holocene, *M. fascicularis* may have been less abundant than *M. nemestrina* in the Malay Peninsula and Sumatra (see above, Fossils and Subfossils). If so, this would require explanation, because *M. fascicularis* is now generally more abundant than *M. nemestrina* in the Malay Peninsula, Sumatra, and elsewhere (Fooden, 1975, p. 61).

Stage II, ca. 160 Ka

The most strongly differentiated populations of *M. fascicularis* inhabit four deep-water islands or island groups: (1) Nicobar Islands, northwest of Sumatra; (2) P. Simeulue and P. Lasia, west of

Sumatra; (3) P. Maratua, east of Borneo; and (4) Philippines, excluding southern islands (Fig. 25). All of these populations are very dark (Appendix 3), and their deep-water island habitats are symmetrically arrayed adjacent to the northwestern and northeastern margins of the Sunda Shelf (cf. Kellogg, 1944, p. 76). Assuming that dark dorsal pelage is derived in *M. fascicularis*, the similar pelage saturation and geographic relationships of these populations suggest that they may have had a similar evolutionary history. These populations appear to have been isolated longer than populations of *M. fascicularis* inhabiting shallow-water fringing islands, which were isolated by rising sea level subsequent to the last glacial maximum, ca. 18 Ka. A working hypothesis is that the progenitors of these strongly differentiated populations reached their deep-water habitats during the penultimate glacial maximum, ca. 160 Ka, when sea level was about 160 m lower than at present, and that these populations have been isolated at least since the subsequent interglacial, ca. 120 Ka. Future new evidence concerning the paleontology, morphology, or molecular biology of these populations may provide a test of this hypothesis.

Nicobar Islands—This group includes 19 islands, of which 11 are larger than about 2 km^2. *M. fascicularis* inhabits only Great Nicobar I., Little Nicobar I., and Katchall I. (Kloss, 1903a, p. 114)—the southernmost 3 of the 11 larger islands. Forest cover in the Nicobars is restricted to these three islands and Tillanchong I., one of the more northern islands (Kloss, 1903a, p. 109). Monkeys, including *M. fascicularis*, are absent from the Andaman Islands, a forested group of deep-water islands that lies between the Nicobar Islands and Burma (Kloss, [1928], p. 802; Chaturvedi, 1980, p. 134).

Great Nicobar is separated from Sumatra by an ocean trench that is 150 km wide and more than 200 m deep; for half of its width, this trench is more than 1,000 m deep. The channel between Great Nicobar and Little Nicobar is 6 km wide and less than 100 m deep, which indicates that these two islands were united during the last glacial maximum. Narrow channels (< 10 km wide) between Little Nicobar and Katchall are more than 120 m deep, which probably indicates that these two islands were not united during the last glacial maximum.

The nonvolant mammal fauna of the Nicobars is limited to one species each of shrew, tree shrew, and pig, four to six species of rats, *M fascicularis,* and humans (Miller, 1902b, p. 792; Kloss, [1928], p. 802; Chaturvedi, 1980, p. 133; Musser & Carleton, 1993, pp. 651, 660); no information is available concerning the date of first arrival of humans in the Nicobars (Fuchs, 1973, p. 285; Gratton, 1992, p. 209). The poverty of the fauna, together with the deep ocean trenches that surround this group of islands, strongly implies that these islands have never had a land connection to Sumatra or any other source of the rich mammalian fauna of Southeast Asia. This in turn implies that *M. fascicularis* reached the Nicobars by over-water dispersal; the absence of this species in the Andaman Islands indicates that it dispersed to the Nicobars from Sumatra, the Malay Peninsula, or the Isthmus of Kra—not from Burma. As noted above, the degree of differentiation of *M. fascicularis* in the Nicobars suggests that this species may have reached these islands during the penultimate glacial maximum, ca. 160 Ka; at this early date, dispersal by natural rafting would be more likely than dispersal by human introduction.

Following the arrival and isolation of *M. fascicularis* in the Nicobars, dorsal pelage in the immigrant population apparently darkened, and skull size increased, resulting in differentiation of the subspecies *M. f. umbrosa.* The present morphological uniformity of populations of this subspecies in the three islands that it inhabits implies relatively recent genetic exchange among these populations; this exchange presumably occurred during the last glacial maximum, ca. 18 Ka, when Great Nicobar was joined to Little Nicobar and the gap between Little Nicobar and Katchall was reduced to narrow channels (< 10 km wide).

The lateral facial crest pattern is infrazygomatic in three of eight *M. f. umbrosa* specimens examined (one of three Great Nicobar specimens, two of three Little Nicobar specimens, zero of two Katchall specimens) (see Appendix 6). Three alternative interpretations would account for the relatively high frequency of the infrazygomatic pattern in *M. f. umbrosa*: (1) it may indicate that the progenitors of *M. f. umbrosa* dispersed to the Nicobars from the Malay Peninsula or Isthmus of Kra, in or near the geographic range of *M. f. aurea* (Figs. 9, 25); (2) it may indicate that the range of *M. f. aurea* extended to Sumatra during the penultimate glacial maximum, when progenitors of *M. f. umbrosa* are hypothesized to have dispersed to the Nicobars; or (3) it may be the result of independent local mutation.

P. Simeulue and P. Lasia—These two islands are approximately 120 km west of northern Sumatra (Fig. 25). Pulau Simeulue is relatively large

(ca. 100 × 25 km) and is about 20 km northwest of the much smaller P. Lasia (ca. 6 × 3 km). Although *M. fascicularis* inhabits both of these islands, it is absent in P. Babi (ca. 8 × 7 km), which is only 3 km south of P. Lasia (Abbott in Miller, 1903a, p. 479).

Deep trenches (> 200 m) separate P. Simeulue and P. Lasia from Sumatra and from each other. The deep trench between P. Simeulue and Sumatra is about 15 km wide, and that between P. Simeulue and P. Lasia is about 4 km wide. The narrow channel between P. Lasia and P. Babi probably is less than 100 m deep.

The nonvolant mammal fauna of the Simeulue group, as reported by Kloss ([1928], p. 802; cf. Sugardjito et al., 1989, p. 197; Musser & Carleton, 1993, pp. 652, 659), is limited to one species each of civet and pig, two species of rats, *M. fascicularis*, and humans. This fauna, like that of the Nicobars (see above), presumably dispersed over water. Judging from the degree of differentiation of *M. fascicularis* in P. Simeulue and P. Lasia, this species may have dispersed to these islands—presumably by natural rafting—during the penultimate glacial maximum. Following isolation, the pelage of the immigrant population darkened. Genetic exchange between the populations in P. Simeulue and P. Lasia probably occurred during the last glacial maximum. During subsequent postglacial reisolation, the tail apparently shortened in the P. Simeulue population (Fig. 27; cf. above, *M. f. lasiae*—Remarks), resulting in differentiation of *M. fascicularis fusca* and *M. f. lasiae*. Because P. Lasia probably was joined to P. Babi during the last glacial maximum, a dark population of *M. fascicularis* probably also inhabited P. Babi at that time but subsequently became locally extinct.

The lateral facial crest pattern is infrazygomatic in 9 of 13 *M. fascicularis fusca* specimens examined and in 1 of 2 *M. f. lasiae* specimens examined (Appendix 6). The geographic location of P. Simeulue and P. Lasia strongly indicates that the progenitors of *M. fascicularis fusca* and *M. f. lasiae* dispersed to these islands from Sumatra, not from the Malay Peninsula or Isthmus of Kra (i.e., in or near the present range of *M. f. aurea;* Fig. 25). This implies either that the range of *M. f. aurea* formerly extended to Sumatra or that there has been independent mutation in these islands from the transzygomatic crest pattern to the infrazygomatic crest pattern.

P. Maratua—This U-shaped island (area ca. 25 km²) is a raised coral atoll 50 km east of north-central Borneo (Fig. 25; Kuenen, 1947, p. 5). It is separated from the Bornean shelf by a deep trench (> 180 m) that is 17 km wide; the water gap is narrowed by the presence of a stepping-stone island, P. Kakaban (area ca. 5 km²), which intervenes in the middle of the trench.

The only mammal collector known to have visited P. Maratua is H. C. Raven, who worked there in August 1912 and May 1913 (Deignan, [1960], p. 267). In P. Maratua, Raven collected *M. fascicularis,* two species of rats, possibly a few other murine rodents, and one species of bat (Kellogg, 1944, p. 75; Musser & Califia, 1982, p. 6; M. D. Carleton, USNM, letter 16 Dec. 1993). Judging from the degree of differentiation of *M. fascicularis* in P. Maratua, it may have dispersed to this island from Borneo during the penultimate glacial maximum, ca. 160 Ka; the dispersal probably was over water—presumably by natural rafting. In isolation, dorsal pelage in the founder population darkened, resulting in differentiation of the subspecies *M. f. tua.* In all four *M. f. tua* specimens examined, the lateral facial crest pattern is transzygomatic, as in Bornean *M. fascicularis.*

Philippines, Excluding Southern Islands—As previously discussed (Fooden, 1991, p. 24), the progenitors of current populations of *M. fascicularis* in western, northern, and eastern islands of the Philippine Archipelago may have dispersed to these islands during the penultimate glacial maximum, ca. 160 Ka. Following isolation, dorsal pelage in the founder population became darker and also tended to become erythristic, resulting in differentiation of *M. f. philippinensis.*

Stage III, > 18 Ka

Indochinese Peninsula and Northern Part of Isthmus of Kra—Although zoogeographic evidence, cited below, indicates that *M. f. aurea* existed as a differentiated subspecies in the western part of the Indochinese Peninsula and northern part of the Isthmus of Kra prior to the last glacial maximum, ca. 18 Ka, the evolutionary history of this subspecies and that of neighboring populations of *M. f. fascicularis* remain enigmatic. Equivocal evidence concerning variation in *M. fascicularis* in the Indochinese Peninsula and Isthmus of Kra is presented in the following paragraphs. The relationship between variation in *M. fascicularis* and variation in *M. mulatta*—a closely related species that replaces *M. fascicularis* in the

northern part of the Indochinese Peninsula (Fooden, 1982, p. 576)—also is indicated.

1. Dorsal pelage color averages paler and less erythristic in the Indochinese Peninsula and northern part of the Isthmus of Kra than in the Malay Peninsula and Sumatra (Tables 1, 3). The pattern of pelage color resemblances is independent of local land connections; the Indochinese Peninsula and Isthmus of Kra are continuous with the Malay Peninsula, which is separated by a water gap from Sumatra. The latitude of pelage color transition is about 10°N, near the southern end of the Isthmus of Kra. The pale dorsal pelage color in *M. fascicularis* north of 10°N generally approaches that in neighboring allopatric populations of *M. mulatta*; however, the posterior part of the dorsal surface is strongly erythristic in *M. mulatta*—and not in Indochinese *M. fascicularis*.

2. In the Indochinese Peninsula north of about 13°N, which is at the northern end of the Isthmus of Kra, head and body length and skull length begin to decline northward in *M. fascicularis* (Fig. 10; Fooden & Albrecht, 1993, p. 532). This decline, which is anti-Bergmannian, is retrograde to the general relationship between size and latitude in core-area *M. fascicularis* and also is retrograde to the relationship between size and latitude in *M. fascicularis* in the Philippines, at approximately the same latitude as the Indochinese Peninsula. The northward decline of size in Indochinese *M. fascicularis* tends to bring the size of this species near to that of neighboring populations of *M. mulatta* (Figs. 29, 30).

3. Tail length declines rapidly in the Indochinese Peninsula north of about 13°N (Fig. 13). This is an acceleration of the general decline of tail length in core-area *M. fascicularis* north of the equator (Allen's rule); there is no comparable accelerated northward decline of tail length in Philippine *M. fascicularis*. Parallel to the trend noted above for head and body length and skull length, the accelerated northward decline of tail length in Indochinese *M. fascicularis* tends to bring the tail length of this species near to that of neighboring populations of *M. mulatta* (Fig. 31; cf. Fooden, 1971, p. 29).

4. The subspecies *M. f. aurea* inhabits a restricted area bordering the Bay of Bengal, mostly west of the mountain ranges that form the border between Burma and Thailand, along the western side of the Indochinese Peninsula and Isthmus of Kra, south to about 10°N (Figs. 9, 25). This subspecies is distinguished by its lateral facial crest pattern, which is infrazygomatic and which contrasts with the transzygomatic pattern that predominates in *M. f. fascicularis*. Adjacent to the geographic range of *M. f. aurea* are two areas—one in central and eastern parts of the Indochinese Peninsula and the other in eastern and southern parts of the Isthmus of Kra—inhabited by heterogeneous populations that include some individuals with the infrazygomatic pattern, some with the transzygomatic pattern, and some with the asymmetric pattern; occasionally, heterogeneous populations have been sampled at a single locality. The southern part of the Indochinese Peninsula is inhabited by a now-disjunct population of *M. f. fascicularis* (homogeneous for the transzygomatic pattern).

The lateral facial crest pattern in shallow-water fringing-island populations of *M. fascicularis* matches that in adjacent mainland populations in Southeast Asia; the crest is infrazygomatic in the Mergui Archipelago—shallow-water islands west of the Isthmus of Kra, and the crest is transzygomatic in shallow-water islands east of the Isthmus of Kra and adjacent to the Malay Peninsula (Fig. 9). This implies that *M. f. aurea* had already differentiated, and was approximately restricted to its present geographic range, prior to the last glacial maximum (ca. 18 Ka), when *M. fascicularis* presumably dispersed from mainland Southeast Asia to adjacent shallow-water islands.

Pelage color, head and body length, tail length, and skull length in populations of *M. f. aurea* are generally similar to those in populations of *M. f. fascicularis* that inhabit similar latitudes in the Indochinese Peninsula and Isthmus of Kra. The lateral facial crest pattern in *M. f. aurea* is similar to that in *M. mulatta,* where the infrazygomatic pattern is predominant (Stewart, 1933, p. 30).

5. The frequencies of mtDNA types, blood-protein alleles, and resistance to *Plasmodium knowlesi* malaria in populations of *M. fascicularis* north of the Isthmus of Kra differ markedly from those in populations south of the Isthmus of Kra (Tables 17, 19; Fooden, 1994, p. 585). The frequency of *P. knowlesi* resistance in populations of *M. fascicularis* north of the Isthmus of Kra is similar to that in *M. mulatta.*

Based on this evidence, the following conclusions may be drawn. Although suggestive, these conclusions are not adequate to explain the evolutionary history of *M. fascicularis* in the Indochinese Peninsula and northern part of the Isthmus of Kra.

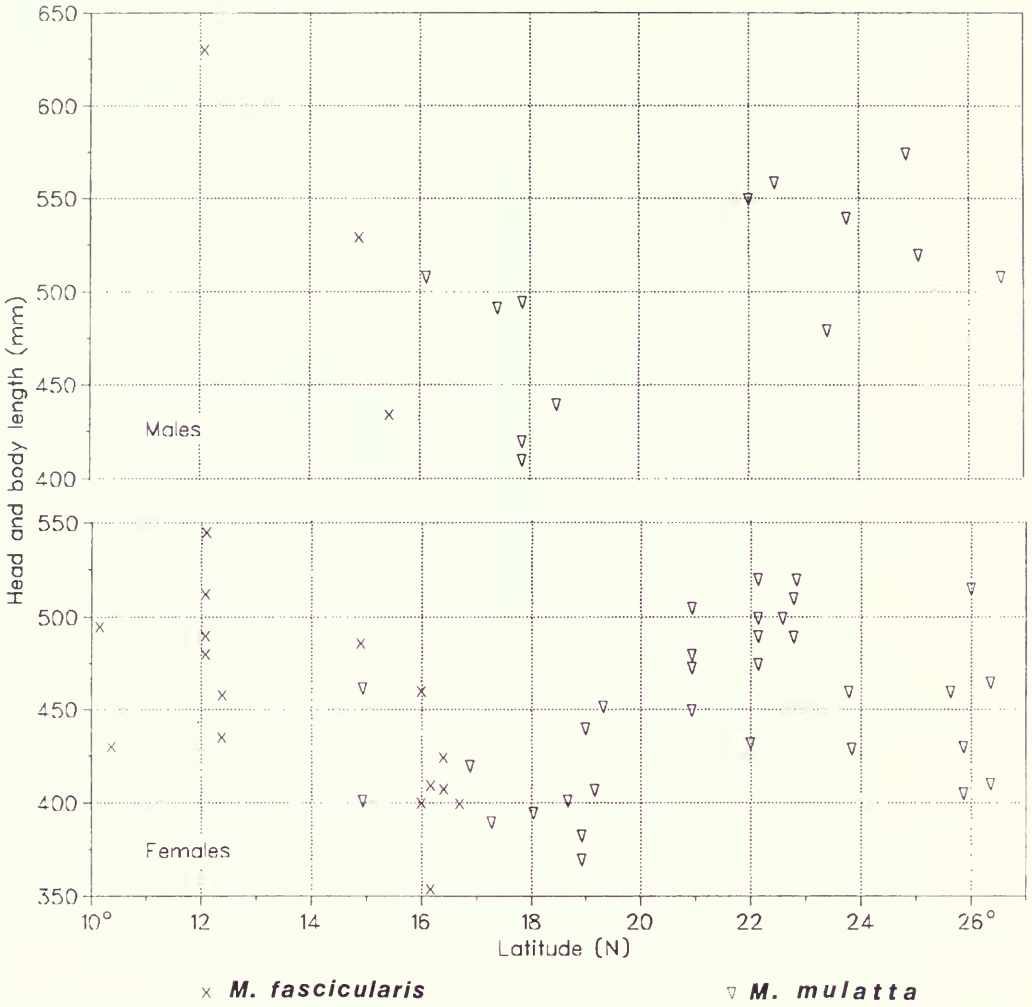

FIG. 29. Latitudinal variation of adult head and body length in samples of *Macaca fascicularis* collected in the southern part of the Indochinese Peninsula and adjacent Isthmus of Kra, north of 10°N (cf. Fig. 10), compared with that in samples of parapatric *M. mulatta* collected in the northern part of the Indochinese Peninsula (Burma, Thailand, Laos, and Vietnam; specimens in AMNH, BM(NH), BNHS, FMNH, MNHN, USNM, ZRC, and ZSI).

1. *Macaca f. aurea* and *M. f. fascicularis* became differentiated in the Indochinese Peninsula and northern part of the Isthmus of Kra sometime before the last glacial maximum; this differentiation probably occurred on opposite sides of the mountain ranges that now form the border between Burma and Thailand. Each of these subspecies probably dispersed from the mainland to shallow-water islands adjacent to its respective range during the last glacial maximum (ca. 18 Ka), when these islands were connected to the mainland by dry land. The population heterogeneous for the lateral facial crest pattern that inhabits central and eastern parts of the Indochinese Peninsula may indicate introgression or intergradation between *M. f. aurea* and *M. f. fascicularis,* or it may indicate introgression or intergradation between *M. fascicularis* and *M. mulatta*; the population heterogeneous for the lateral facial crest pattern that inhabits eastern and southern parts of the Isthmus of Kra presumably indicates introgression or intergradation between *M. f. aurea* and *M. f. fascicularis.* The disjunct population of *M. f. fascicularis* in the southern part of the Indochinese

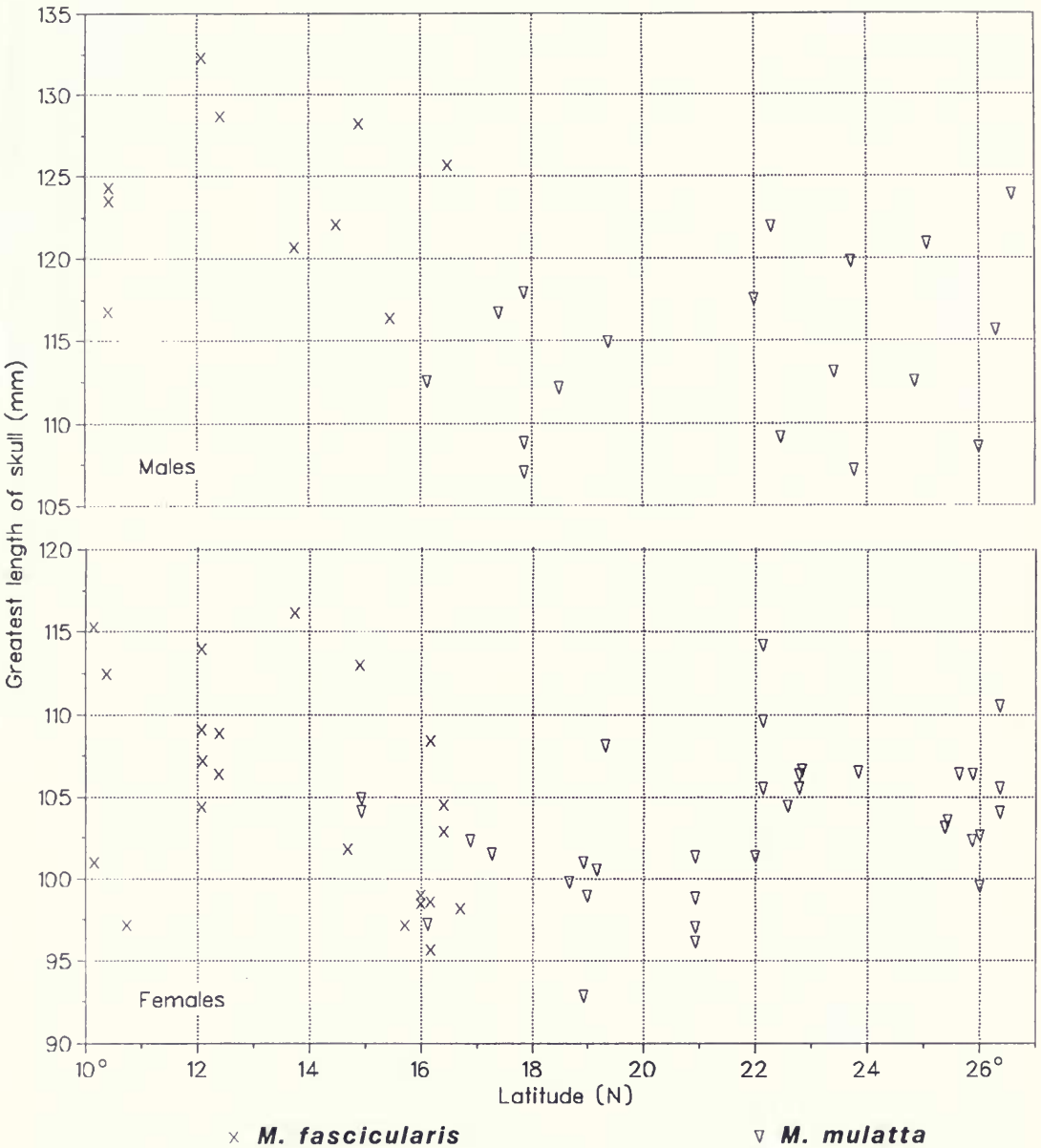

FIG. 30. Latitudinal variation of adult greatest length of skull in samples of *Macaca fascicularis* collected in the southern part of the Indochinese Peninsula and adjacent Isthmus of Kra, north of 10°N (cf. Fig. 21), compared with that in samples of parapatric *M. mulatta* collected in the northern part of the Indochinese Peninsula (Burma, Thailand, Laos, and Vietnam; specimens in AMNH, BM(NH), BNHS, FMNH, MCZ, MNHN, USNM, ZRC, and ZSI).

Peninsula was geographically continuous with the population of the same subspecies in the Malay Peninsula during the last glacial maximum (Fig. 3).

2. Within *M. f. fascicularis,* a strong but incomplete barrier to gene exchange has existed in the region of the Isthmus of Kra. This barrier has had a more profound effect on differentiation of populations of this subspecies north and south of the Isthmus of Kra than the Strait of Malacca (age 5–

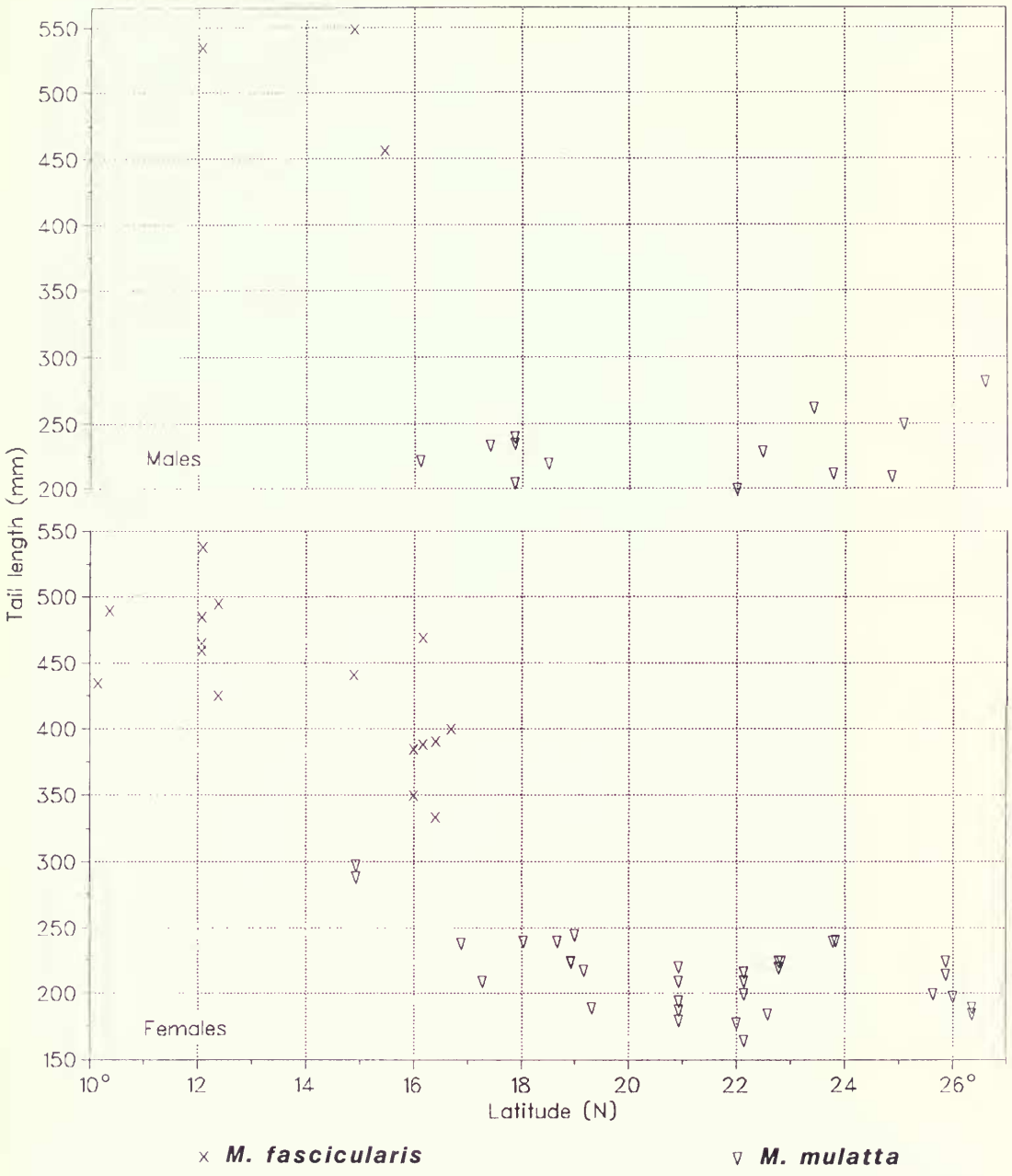

FIG. 31. Latitudinal variation of adult tail length in samples of *Macaca fascicularis* collected in the southern part of the Indochinese Peninsula and adjacent Isthmus of Kra, north of 10°N (cf. Fig. 13), compared with that in samples of parapatric *M. mulatta* collected in the northern part of the Indochinese Peninsula (Burma, Thailand, Laos, and Vietnam; specimens in AMNH, BM(NH), BNHS, FMNH, MNHN, USNM, ZRC, and ZSI).

18 K yr) has had on populations in the Malay Peninsula and Sumatra. Many other vertebrates—including amphibians, reptiles, birds, and mammals—also are differentiated north and south of the Isthmus of Kra, which approximately marks the boundary between the Indochinese and Indomalayan faunal subregions (Chasen, 1940a, p. x; Corbet & Hill, 1992, p. 3).

3. Populations of *M. f. aurea* and *M. f. fascicularis* in the northern part of the Isthmus of Kra and Indochinese Peninsula tend to be transitional between *M. fascicularis* in the Sunda Shelf area and *M. mulatta,* which replaces *M. fascicularis* in the northern part of the Indochinese Peninsula.

Stage IV, ca. 18 Ka

P. Nias—Although P. Nias is a deep-water island, its population of *M. fascicularis* is not strongly differentiated (see above, Subspecific Taxonomy), which suggests relatively recent isolation of this population. The strait between P. Nias (area ca. 3,500 km^2) and the west coast of northern Sumatra is about 90 km wide, but the deep channel (120–180 m) in this strait is only about 20 km wide. The nonvolant mammal fauna reported for P. Nias by Kloss ([1928], p. 802; cf. Musser & Califia, 1982, pp. 11, 18; Musser & Carleton, 1993, pp. 614, 633, 652) is limited to *M. fascicularis,* one species each of tree shrew, binturong, pig, tragulid, and pangolin, two species of deer, and five species of murine rodents.

Macaca fascicularis may have dispersed to P. Nias from Sumatra during the last glacial maximum, ca. 18 Ka, when the intervening water gap was reduced to about 20 km. During subsequent isolation, the proximodorsal surface of the tail in the P. Nias population apparently became darker and the tail apparently became shorter. In all 12 specimens examined of *M. fascicularis* from P. Nias, the lateral facial crest pattern is transzygomatic, as in Sumatran *M. fascicularis*.

Philippines, Southern Islands—As previously noted (Fooden, 1991, p. 6), dorsal pelage color in *M. fascicularis* in southern islands of the Philippine Archipelago is paler than in *M. f. philippinensis,* which inhabits western, northern, and eastern islands in this archipelago. The pale southern populations, which are allocated to the nominotypical subspecies *M. f. fascicularis,* are indistinguishable in pelage color from populations in Borneo. This strongly suggests that progenitors of the southern populations dispersed from Borneo to the Philippines more recently—possibly during the last glacial maximum—than progenitors of *M. f. philippinensis* (see above). Present distributions indicate that the relatively recent dispersal of *M. f. fascicularis* to the southern Philippines occurred via the Sulu Archipelago (Fooden, 1991, p. 28). In Negros and Mindanao, a zone of mixed populations that include pale, intermediate, and dark individuals may be the result of interbreeding between early-arriving *M. f. philippinensis* and late-arriving *M. f. fascicularis.*

Stage V, < 18 Ka

Shallow-Water Fringing Islands, Excluding P. Bali—During the last glacial maximum, ca. 18 Ka, sea level was approximately 120 m lower than at present, and shallow-water fringing islands—together with Sumatra, Borneo, and Java—were part of a single large landmass that extended from the Indochinese Peninsula to P. Bali (Fig. 3; Heaney, 1991a, p. 55). This permitted dispersal, or redispersal, of *M. fascicularis* over dry land to what are now shallow-water islands; as a result, populations of *M. fascicularis* in all of these present-day islands were genetically continuous. Subsequently, between 18 Ka and 5 Ka, sea level rose to its present level, and present-day shallow-water insular populations of *M. fascicularis* became isolated.

Following isolation, populations of *M. fascicularis* in many shallow-water fringing islands apparently have tended to become slightly darker, more erythristic, and/or smaller than their ancestral stock, assuming that this stock is represented by core-area populations (Table 9; Appendixes 3, 4; Fooden & Albrecht, 1993, p. 533). The darkest shallow-water fringing-island population, *M. f. karimondjawae* in P. Karimunjawa and presumably also in P. Kemujan, may have become isolated somewhat earlier than most other shallow-water fringing-island populations (Appendix 3). The distinctive dark crown patches of *M. f. atriceps* in Ko Khram Yai and *M. f. condorensis* in Con Son and Hon Ba presumably also developed in isolation following elevation of sea level since the last glacial maximum. During the same interval, dorsal pelage erythrism in *M. f. fascicularis* in Borneo apparently differentiated somewhat from that in the same subspecies in Sumatra and the Malay Peninsula (Tables 3, 4).

Despite postglacial isolation, many shallow-water island populations of *M. fascicularis* appear to have retained ancestral characters. Size is similar at similar latitudes in currently isolated populations in the Malay Peninsula, Sumatra, and Borneo (Fig. 10; Fooden & Albrecht, 1993, p. 533). Dorsal pelage erythrism and tail length are more similar in populations in the Malay Peninsula and

Sumatra, which are now isolated, than in populations in the Malay Peninsula and the Indochinese Peninsula, which are connected by dry land (Tables 3, 10). The infrazygomatic lateral facial crest pattern apparently has persisted in populations in the Mergui Archipelago despite the postglacial isolation of these islands from the Isthmus of Kra (Fig. 9).

LESSER SUNDA ISLANDS: P. BALI, NUSA PENIDA, AND P. LOMBOK—Pulau Bali is the only shallow-water fringing island in the Lesser Sunda group (Fig. 3; Kitchener et al., 1990, p. 111). The strait between Java and P. Bali is approximately 3 km wide and has a maximum depth of about 65 m. The strait between P. Bali and Nusa Penida is about 10 km wide and has a depth of more than 120 m for about half of its width. The strait between Nusa Penida and P. Lombok is approximately 23 km wide and has a depth of more than 120 m for almost all of its width.

All three of these islands are inhabited by *M. fascicularis* (Fig. 2C). The only other nonhuman primate known to inhabit the Lesser Sundas is one species of leaf monkey, *Trachypithecus auratus,* the range of which includes P. Bali and P. Lombok. In these two islands, *T. auratus* is represented by an endemic subspecies, *T. a. kohlbruggei* (P. H. Napier, 1985, p. 56; Weitzel & Groves, 1985, p. 402; Groves, 1993, p. 273).

During the last glacial maximum, ca. 18 Ka, P. Bali was joined to Java, but Nusa Penida and P. Lombok were separate islands (Kitchener et al., 1990, p. 111; Heaney, 1991a, p. 55). At that time, populations of *M. fascicularis* and *T. auratus* in P. Bali presumably were genetically continuous with those in Java. It is unclear whether or not the last glacial maximum was the time of initial dispersal of *M. fascicularis* and *T. auratus* from Java to P. Bali; these species may have dispersed from Java during a previous glacial cycle, and their insular populations may merely have been reunited during the last glacial maximum.

In either event, sometime before 5 Ka, rising sea level separated P. Bali from Java and, consequently, separated populations of *M. fascicularis* and *T. auratus* in P. Bali from those in Java. Following this separation, *M. fascicularis* in P. Bali apparently underwent reduction in body size (Figs. 15, 22; Appendix 7) and also underwent a marked shift in allele frequencies at blood-protein loci HbA-II, Pi, and Tf (Table 19). Concurrently, *T. auratus* in P. Bali apparently became subspecifically distinct from *T. auratus* in Java.

The characters that distinguish *M. fascicularis* and *T. auratus* in P. Bali from their respective conspecifics in Java link populations of these species in P. Bali to those in P. Lombok. This strongly suggests that, subsequent to their differentiation in P. Bali, populations of both species dispersed—over water—from P. Bali to P. Lombok, as previously proposed by Kawamoto and Suryobroto (1985, p. 39); the dispersal of *M. fascicularis* to Nusa Penida, located between P. Bali and P. Lombok, presumably occurred at the same time. Whether the dispersal of *M. fascicularis* and *T. auratus* from P. Bali to P. Lombok was by natural rafting or by human transport is uncertain (cf. Everett in Hartert, 1896, p. 593; Kitchener et al., 1990, p. 112).

Stage VI, ca. 4.5 Ka

LESSER SUNDA ISLANDS: P. SUMBAWA–P. TIMOR—*Macaca fascicularis* is known to inhabit 13 of the deep-water Lesser Sunda Islands east of P. Lombok (listed in west–east order): P. Sumbawa, P. Moyo, P. Sumba, P. Rinca, Nusa Kode, P. Mangiatan, P. Seraya Besar, P. Flores, P. Adonara, P. Solor, P. Semau, P. Kambing, and P. Timor (Fig. 2C). This species reportedly is absent in P. Komodo and P. Padar (between P. Sumbawa and P. Rinca, north of P. Sumba), and in many nearby islets, and also is absent in P. Lomblen, P. Pantar, and P. Alor (east of P. Adonara and P. Solor, north of P. Timor) (for documentation, see Gazetteer, Appendix 2). No other nonhuman primate inhabits any of the Lesser Sunda Islands east of P. Lombok.

None of these islands were connected to P. Bali during the last glacial maximum, although some of these islands were interconnected at that time to form four larger islands (Lombok–Sumbawa–Moyo, Sumba, Komodo–Padar–Rinca–Kode–Mangiatan–Seraya Besar–Flores–Alor–Solor, and Semau–Kambing–Timor) (Heaney, 1991a, p. 55). The isolation of these deep-water islands is reflected in their relatively poor nonvolant mammal faunas (Laurie & Hill, 1954, pp. 13 ff.). In P. Flores (area ca. 20,000 km^2), for example, Musser (1981, p. 134) listed 16 species of nonvolant mammals (shrews, 3; *M. fascicularis*; civet, 1; pigs, 2; deer, 1; porcupine, 1; rats, 5; mice, 2), of which some probably were introduced by humans. This contrasts with 38 species of nonvolant mammals recorded for P. Bangka (area ca. 12,000 km^2), a shal-

low-water island on the Sunda Shelf (Heaney, 1984, p. 12).

Four items of partly contradictory evidence seem most relevant to attempting an interpretation of the history of *M. fascicularis* in deep-water Lesser Sunda Islands east of P. Lombok: (1) Dorsal pelage color in these islands is essentially similar to dorsal pelage color in Java, P. Bali, and P. Lombok (Appendixes 3, 4). (2) External and cranial size in these islands is similar to size in P. Bali and P. Lombok (Figs. 15, 16, 22, 23); size is greater in Java. (3) Blood-protein allele frequencies at loci HbA-II, Pi, and Tf in these islands are similar to allele frequencies in Java (Table 19); frequencies of these alleles are divergent in P. Bali and P. Lombok. (4) Subfossils of *M. fascicularis* in P. Timor cave deposits appear relatively late (ca. 4.5 Ka), concurrently with the appearance of remains of domestic animals and pottery (see above, Fossils and Subfossils).

The evidence of dorsal pelage color and Timor cave deposits suggests relatively recent dispersal of *M. fascicularis* to deep-water Lesser Sunda Islands east of P. Lombok. The blood-protein evidence indicates that the differentiated populations of *M. fascicularis* in P. Bali and P. Lombok probably were not directly involved in dispersal of this species to islands east of P. Lombok. Assuming that the differentiated populations in P. Bali and P. Lombok inhabited those islands before *M. fascicularis* dispersed to islands east of P. Lombok (see above), the implication is that populations of *M. fascicularis* east of P. Lombok were derived from a source in Java, or elsewhere west of P. Bali. This geographic incongruity, together with the archeological evidence of the Timor cave deposits, strongly supports the hypothesis that the populations of *M. fascicularis* in the Lesser Sundas east of P. Lombok are the result of human introduction, beginning ca. 4.5 Ka; this hypothesis has been previously proposed by Musser (1981, p. 133), Kawamoto and Suryobroto (1985, p. 39), and Glover (1986, p. 159).

Multiple introductions would be required to establish populations of *M. fascicularis* in all of the islands east of P. Lombok that it now inhabits. If Java was the source of these introductions, external and cranial size became convergently reduced in these islands. This is inconvenient to the hypothesis, but not impossible, considering the frequency of insular dwarfing in *M. fascicularis* (see above, External Measurements and Proportions; Cranial Characters).

Auffenberg (1981, p. 242) suggests that the absence of *M. fascicularis* in P. Komodo (area 393 km²) and P. Padar (13 km²) may be attributable to an insufficient year-round supply of fruit in these islands. This is puzzling, because small islands immediately east of P. Komodo and P. Padar support populations of *M. fascicularis* (P. Rinca, 278 km²; Nusa Kode [= P. Oewada Sami], 9.6 km²; P. Seraya Besar [= P. Seraja], 3.6 km²; P. Mangiatan [= P. Mengjatan], 1 km²). The insular distribution of *M. fascicularis* in this area may be affected in some way by the distribution of the Komodo giant monitor, a known predator of these monkeys (see above, Natural History) that is restricted to the following seven islands (listed in west–east order): P. Komodo, Nusa Mbarapu (0.6 km², occasionally visited by giant monitors), P. Padar, P. Rinca, Nusa Kode, Gili Motang (= Gili Mota), and western P. Flores (Auffenberg, 1981, p. 40). *M. fascicularis* coexists with the giant monitor only in three of the more easterly of these islands (P. Rinca, Nusa Kode, and P. Flores).

The relatively recent dispersal of *M. fascicularis* to deep-water Lesser Sunda Islands, indicated by evidence cited above, is somewhat surprising. This species has been present in east-central Java since ca. 1 Ma (see above), and, during the maximum Pleistocene glaciation, the widest water gap between Java and Sumbawa may have been only 400 m or less (Kitchener et al., 1990, p. 110). However, as indicated by Heaney (1991a, p. 57), during glacial maxima, rainfall in the Lesser Sundas was much lower than at present. Perhaps forest cover was inadequate to sustain *M. fascicularis* in these islands during glacial maxima, when low sea level and narrow water gaps might otherwise have facilitated the eastward dispersal of this species.

Acknowledgments

The generous cooperation of curators and staff members of institutions in which specimens examined are preserved (see Introduction) has been indispensable to the conduct of this research and is gratefully acknowledged. For valuable supplementary advice and assistance, I also thank the following: H. Abdulali (BNHS), N. Aggimarangsee (Chiang Mai University, Thailand), M. Aimi (PRI), G. H. Albrecht (University of Southern California, Los Angeles), W. Y. Brockelman (Mahidol University, Bangkok), M. D. Carleton (USNM), S.

Chakraborty (ZSI), C. Fleming (AMNH), W. K.-H. Fuchs (AMNH), L. Gordon (USNM), C. P. Groves (Australian National University, Canberra), L. R. Heaney (FMNH), P. D. Jenkins (BM(NH)), Y. Kawamoto (PRI), J. C. Kerbis Peterhans (FMNH), J. W. Koeppl (FMNH), S. M. Lanyon (FMNH), G. G. Musser (AMNH), Shukor Md. Nor (FMNH), B. D. Patterson (FMNH), D. P. Schmidt (USNM), S. Unnithan (BNHS), and P. F. D. Van Peenen (U.S. Navy, retired, Chicago). I am also grateful to three reviewers, who painstakingly scrutinized the manuscript and provided numerous helpful suggestions.

Literature Cited

ABDULALI, H. 1967. The birds of the Nicobar Islands, with notes on some Andaman birds. Journal of the Bombay Natural History Society, **64:** 139–190.

ADI HAJI TAHA. 1985. The re-excavation of the rockshelter of Gua Cha, Ulu Kelantan, West Malaysia. Federation Museums Journal, n.s., **30:** i–xi, 1–134.

AGGIMARANGSEE, N. 1992. Survey for semi-tame colonies of macaques in Thailand. Natural History Bulletin of the Siam Society, **40:** 103–166.

AIMI, M. 1981. Fossil *Macaca nemestrina* (Linnaeus, 1766) from Java, Indonesia. Primates, **22:** 409–413.

AIMI, M., AND F. AZIZ. 1985. Vertebrate fossils from the Sangiran Dome, Mojokerto, Trinil and Sambungmacan areas, pp. 155–168. *In* Watanabe, N., and D. Kadar, eds., Quaternary Geology of the Hominid Fossil Bearing Formations in Java. Special Publication No. 4. Geological Research and Development Centre, Indonesia.

AIMI, M., A. BAKAR, AND J. SUPRIATNA. 1982. Morphological variation of the crab-eating macaque, *Macaca fascicularis* (Raffles, 1821), in Indonesia. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **2:** 51–56.

ALCASID, G. L. [1970]. Checklist of Philippine Mammals. National Museum, Manila, 51 pp. [For date of publication, see Heaney, L. R., and D. S. Rabor, 1982, Occasional Papers of the Museum of Zoology, University of Michigan, **699:** 29.]

ALDRICH-BLAKE, F. P. G. 1980. Long-tailed macaques, pp. 147–165. *In* Chivers, D. J., ed., Malayan Forest Primates: Ten Years' Study in Tropical Rain Forest. Plenum, New York.

ALLEN, G. M., AND H. J. COOLIDGE, JR. 1940. Mammal and bird collections of the Asiatic Primate Expedition. Mammals. Bulletin of the Museum of Comparative Zoology at Harvard College, **87:** 131–166.

ANDERSON, C. M., AND C. F. BIELERT. 1994. Adolescent exaggeration in female catarrhine primates. Primates, **35:** 283–300.

ANDERSON, J. 1879. Anatomical and Zoological Researches: Comprising an Account of the Zoological Results of the Two Expeditions to Western Yunnan in 1868 and 1875, vol. 1. Bernard Quaritch, London, 985 pp. [For date of publication, see Corrigenda, between pp. xii and xiii.]

———. 1881. Catalogue of Mammalia in the Indian Museum, Calcutta. Part I. Primates, Prosimiae, Chiroptera, and Insectivora. Indian Museum, Calcutta, xv + 225 pp.

ANDREWS, C. W. 1900. Mammalia, pp. 22–33. *In* Andrews, C. W., ed., A Monograph of Christmas Island (Indian Ocean): Physical Features and Geology, with Descriptions of the Fauna and Flora. British Museum (Natural History), London.

ANDREWS, R. C. 1911. Around the world for the Museum. American Museum Journal, **11:** 21–24.

———. 1943. Under a Lucky Star: A Lifetime of Adventure. Viking Press, New York, 300 pp.

ANGST, W. 1973. Pilot experiments to test group tolerance to a stranger in wild *Macaca fascicularis*. American Journal of Physical Anthropology, **38:** 625–630.

———. 1974. Das Ausdrucksverhalten des Javaneraffen *Macaca fascicularis* Raffles 1821. Fortschritte der Verhaltensforschung, **15:** 1–91.

———. 1975. Basic data and concepts on the social organization of *Macaca fascicularis*, pp. 325–388. *In* Rosenblum, L. A., ed., Primate Behavior: Developments in Field and Laboratory Research, vol. 4. Academic Press, New York.

ANGST, W., AND D. THOMMEN. 1977. New data and a discussion of infant killing in Old World monkeys and apes. Folia Primatologica, **27:** 198–227.

ANNANDALE, N., AND H. C. ROBINSON. 1903. Itinerary in Perak, Selangor, and the Siamese Malay states, pp. i–xlii. *In* Annandale, N., and H. C. Robinson, eds., Fasciculi Malayensis: Anthropological and Zoological Results of an Expedition to Perak and the Siamese Malay States, 1901–1902. Anthropology, Part I. Longmans, Green & Co., London.

ANONYMOUS. 1851. Opsomming der thans bekende zoogdieren van den Indischen Archipel, getrokken uit de Zoölogy of the Voyage of H. M. Ship Samarang (Lond. 1850). Natuurkundig Tijdschrift voor Nederlandsch Indië, **2:** 443–455.

———. 1931. Photographing wild beasts alive: "Sitters" in Bali and Java. Illustrated London News, **88:** 457.

———. 1977. Sundarban Forest—Bangladesh. Tigerpaper, **4**(2): 13–15.

———. 1994. Kaser Doo Wildlife Sanctuary, Burma. Asian Primates, **3**(3–4): 11–12.

ARNOLD, G. 1959. Longhouse and Jungle: An Expedition to Sarawak. Chatto and Windus, London, 206 pp.

AUDEBERT, J. B. 1798–1799. Histoire Naturelle des Singes et des Makis. Quatrième Famille, pp. 1–10. Desray, Paris.

AUFFENBERG, W. 1981. The Behavioral Ecology of the Komodo Monitor. University Presses of Florida, Gainesville, 406 pp.

AZIZ, F. 1989. *Macaca fascicularis* (R[a]ffles) from Ngandong, East Java. Publication of the Geological Research and Development Centre, Indonesia, Paleontology Series, **5:** 50–56.

AZUMA, S., A. SUZUKI, AND Y. RUHIYAT. 1984. The distribution of primates in Sebulu and R. Mahakan. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **3:** 45–54.

BADOUX, D. M. 1959. Fossil mammals from two fissure deposits at Punung (Java), with some remarks on migration and evolution of mammals during the Quaternary in South East Asia. Thesis, Rijksuniversiteit te Utrecht, Kemink en Zoon, Utrecht, 151 pp.

BAKAR, A., M. AMIR, AND MARSHAL. 1981. Morphological studies on the crab-eating monkey in Indonesia. Kyoto University Overseas Research Report of Studies on Indonesian Macaque, **1:** 11–14.

BANKS, E. 1931. A popular account of the mammals of Borneo. Journal of the Malayan Branch of the Royal Asiatic Society, **9**(2): 1–139.

———. 1978. Mammals from Borneo. Brunei Museum Journal, **4**(2): 165–241.

BARBE, P. 1846. Notice of the Nicobar Islands. Journal of the Asiatic Society of Bengal, Calcutta, **15:** 344–367.

BARNICOT, N. A., E. R. HUEHNS, AND C. J. JOLLY. 1966. Biochemical studies on haemoglobin variants of the irus macaque. Proceedings of the Royal Society of London, ser. B, **165:** 224–244.

BARNICOT, N. A., P. T. WADE, AND P. COHEN. 1970. Evidence for a second haemoglobin α-locus duplication in *Macaca irus*. Nature, **228:** 379–381.

BARTELS, M., JR. 1929. Iets over het voedsel van den panter. Tropische Natuur, **18:** 81–83.

BECCARI, O. 1904. Wanderings in the Great Forests of Borneo: Travels and Researches of a Naturalist in Sarawak. Arnold Constable & Co., London, 424 pp.

BELLWOOD, P. 1985. Prehistory of the Indo-Malaysian Archipelago. Academic Press, Sydney, x + 370 pp.

BERENSTAIN, L. 1986. Responses of long-tailed macaques to drought and fire in eastern Borneo: A preliminary report. Biotropica, **18:** 257–262.

BERKSON, G. 1968. Weight and tooth development during the first year in *Macaca irus*. Laboratory Animal Care, **18:** 352–355.

———. 1970. Defective infants in a feral monkey group. Folia Primatologica, **12:** 284–289.

BERNSTEIN, I. S. 1966. Naturally occurring primate hybrid. Science, **154:** 1559–1560.

———. 1967. Intertaxa interactions in a Malayan primate community. Folia Primatologica, **7:** 198–207.

———. 1968a. Social status of two hybrids in a wild troop of *Macaca irus*. Folia Primatologica, **8:** 121–131.

———. 1968b. The lutong of Kuala Selangor. Behaviour, **32:** 1–16.

BISMARK, M. 1992. Peranan hutan di luar kawasan pelestarian alam dalam konservasi populasi *Macaca fascicularis*. Bulletin Penelitian Hutan, **549:** 9–18.

BLAINVILLE, H. M. D. DE. [1839]. Ostéographie des primates. Sur les primates en général et sur les singes (*Pithecus*) en particulier, pp. 1–52. *In* Blainville, H. M. D. de, Ostéographie . . . des Mammifères, vol. 1 and atlas. J. B. Baillière et Fils, Paris. [For date of publication, see C. D. Sherborn, 1898, Annals and Magazine of Natural History, 7th ser., **2:** 76.]

BLANFORD, W. T. [1888a]. Critical notes on the nomenclature of Indian mammals. Proceedings of the Zoological Society of London, **1887:** 620–638. [For date of publication, see Duncan, F. M., 1937, Proceedings of the Zoological Society of London, ser. A, **107:** 74.]

———. 1888b. The Fauna of British India, Including Ceylon and Burma. Mammalia. Taylor and Francis, London, xx + 617 pp. [For date of publication, see Preface, p. iii.]

BLEEKER, P. 1851. Zoogdieren van Banka. Natuurkundig Tijdschrift voor Nederlandsch Indië, **2:** 527–528.

BLYTH, E. 1844. Notices of various mammalia with descriptions of many new species. Part I.—The Primates, Lin. Journal of the Asiatic Society of Bengal, Calcutta, **13:** 463–494.

———. 1846. Notes on the fauna of the Nicobar Islands. Journal of the Asiatic Society of Bengal, Calcutta, **15:** 367–379.

———. 1847. Supplementary report of the curator of the Zoology Department. Journal of the Asiatic Society of Bengal, Calcutta, **16:** 728–737.

———. 1859. Report of Curator, Zoological Department, for February to May Meetings, 1859. Journal of the Asiatic Society of Bengal, Calcutta, **28:** 271–298.

———. 1863. Catalogue of the Mammalia in the Museum Asiatic Society. Asiatic Society, Calcutta, 187 + xiii pp.

———. 1875. Catalogue of mammals and birds of Burma. Journal of the Asiatic Society of Bengal, Calcutta, **44**(2), extra number: 1–64.

BONHOTE, J. L. [1901]. On the mammals collected during the "Skeat Expedition" to the Malay Peninsula, 1899–1900. Proceedings of the Zoological Society of London, **1900:** 869–883. [For date of publication, see Duncan, F. M., 1937, Proceedings of the Zoological Society of London, ser. A, **107:** 75.]

———. 1903. Report on the mammals, pp. 1–45. *In* Annandale, N., and H. C. Robinson, eds., Fasciculi Malayensis: Anthropological and Zoological Results of an Expedition to Perak and the Siamese Malay States, 1901–1902. Zoology, Part I. Longmans, Green & Co., London.

BOONRATANA, R. 1988. Survey of mammals in South Thailand parks. Natural History Bulletin of the Siam Society, **36:** 71–84.

BOWEN, W. H., AND G. KOCH. 1970. Determination of age in monkeys (*Macaca irus*) on the basis of dental development. Laboratory Animals, **4:** 113–123.

BRINK, L. M. VAN DEN. 1982. On the mammal fauna of the Wajak Cave, Java (Indonesia). Modern Quaternary Research in Southeast Asia, **7:** 177–193.

BROCKELMAN, W. Y. 1981. Field research on primates in Thailand. Journal of the Science Society of Thailand, **7:** 9–17.

BUFFON, G. L. L. DE, AND L. J. M. DAUBENTON. 1766. Histoire Naturelle, Générale et Particulière, avec la Description du Cabinet du Roi, vol. 14. L'Imprimerie Royal, Paris, 411 pp.

BURGESS, P. F. 1961. Wild life conservation in North Borneo, pp. 143–151. *In* Wyatt-Smith, J., and P. R.

Wycherley, eds., Nature Conservation in Western Malaysia, 1961. Malayan Nature Society, Kuala Lumpur.

Burke, D. S., R. R. Graham, and G. B. Heisey. 1981. Hepatitis A virus in primates outside captivity. Lancet, **1981**(2): 928.

Burkhill, H. M. 1961. Protection of wild life on Singapore Island. Malayan Nature Journal, **Special Issue:** 152–164.

Büttikofer, J. 1897. Zoological results of the Dutch Scientific Expedition to Central Borneo. Introduction. Notes from the Leyden Museum, **19:** 1–25.

Cabrera, A. 1910. On the scientific names of certain primates. Annals and Magazine of Natural History, 8th ser., **6:** 617–621.

Cadigan, F. C., and Lim Boo Liat. 1975. The future of Southeast Asian nonhuman primates, pp. 83–93. *In* Bermant, G., and D. G. Lindburg, eds., Primate Utilization and Conservation. John Wiley & Sons, New York.

Caldecott, J. O. 1986a. A summary of the ranging and activity patterns of the pig-tailed macaque (*Macaca n. nemestrina*) in relation to those of sympatric primates in peninsular Malaysia, pp. 152–158. *In* Taub, D. M., and F. A. King, eds., Current Perspectives in Primate Social Dynamics. Van Nostrand Reinhold, New York.

———. 1986b. An ecological and behavioural study of the pig-tailed macaque. Contributions to Primatology, **21:** i–xiii, 1–259.

Cande, S. C., and D. V. Kent. 1992. A new geomagnetic polarity time scale for the Late Cretaceous and Cenozoic. Journal of Geophysical Research, **97**(B10): 13,917–13,951.

Cannon, C. H., and M. Leighton. 1994. Comparative locomotor ecology of gibbons and macaques: Selection of canopy elements for crossing gaps. American Journal of Physical Anthropology, **93:** 505–524.

Cant, J. G. H. 1988. Positional behavior of long-tailed macaques (*Macaca fascicularis*) in northern Sumatra. American Journal of Physical Anthropology, **76:** 29–37.

Cantor, T. 1846. Catalogue of Mammalia inhabiting the Malayan peninsula and islands. Journal of the Asiatic Society of Bengal, Calcutta, **15:** 171–203.

Carpenter, A. 1887. Monkeys opening oysters. Nature, **36:** 53.

Chance, M. R. A., G. R. Emory, and R. G. Payne. 1977a. Status referents in long-tailed macaques (*Macaca fascicularis*): Precursors and effects of female rebellion. Primates, **18:** 611–632.

Chance, M. R. A., E. Jones, and S. Shostak. 1977b. Factors influencing nursing in *Macaca fascicularis*. Folia Primatologica, **27:** 28–40.

Chasen, F. N. 1924a. A preliminary account of the mammals of Singapore Island. Singapore Naturalist, **3:** 76–86.

———. 1924b. Notes on the fauna of Pulau Bulan, Rhio Archipelago. Journal of the Malayan Branch of the Royal Asiatic Society, **2:** 58–62.

———. 1925. Notes on the fauna of Pulau Galang, Rhio Archipelago. Journal of the Malayan Branch of the Royal Asiatic Society, **3:** 92–97.

———. 1931. The herpetology of Mt. Kinabalu, North Borneo, 13,455 ft.: Introduction. Bulletin of the Raffles Museum, Singapore, **5:** 3–7.

———. 1935a. On a collection of mammals from the Natuna Islands, South China Sea. Bulletin of the Raffles Museum, Singapore, **10:** 5–42.

———. 1935b. On some mammals from the Karimata Islands and Dutch West Borneo. Treubia, **15:** 1–7.

———. 1940a. A handlist of Malaysian mammals. Bulletin of the Raffles Museum, Singapore, **15:** i–xx, 1–209.

———. 1940b. The mammals of The Netherlands Indian Mt. Leuser Expedition 1937 to North Sumatra. Treubia, **17:** 479–502.

Chasen, F. N., and C. B. Kloss. 1928a. On a collection of birds from the Anamba Islands, South China Sea. Journal of the Malayan Branch of the Royal Asiatic Society, **6:** 43–63.

———. 1982b. On a collection of mammals from the Anamba Islands, South China Sea. Journal of the Malayan Branch of the Royal Asiatic Society, **6:** 28–42.

———. 1931. On a collection of mammals from the lowlands and islands of North Borneo. Bulletin of the Raffles Museum, Singapore, **6:** 1–82.

Chaturvedi, Y. 1980. Mammals of the Andamans and Nicobars: Their zoogeography and faunal affinity. Records of the Zoological Survey of India, **77:** 127–139.

Cheang, K. C. 1962. Monkeys at Waterfall Gardens, Penang. Malayan Nature Journal, **16:** 73.

Chesner, C. A., W. I. Rose, A. Deino, R. Drake, and J. A. Westgate. 1991. Eruptive history of Earth's largest Quaternary caldera (Toba, Indonesia) clarified. Geology, **19:** 200–203.

Chevalier-Skolnikoff, S. 1975. Heterosexual copulatory patterns in stumptail macaques (*Macaca arctoides*) and in other macaque species. Archives of Sexual Behavior, **4:** 199–220.

Chiarelli, A. B. 1972. Taxonomic Atlas of Living Primates. Academic Press, London, 362 pp.

Chino, F., K. Eto, T. Ohkawa, T. Muto, and T. Komatsu. 1992. Different susceptibilities to attenuated poliovirus of cynomolgus monkeys from the Philippines and other Southeast Asian countries. Japanese Journal of Medical Science and Biology, **45:** 9–17.

Chivers, D. J. 1971. The Malayan siamang. Malayan Nature Journal, **24:** 78–86.

Chivers, D. J., and K. M. Burton. [1991]. Some observations on the primates of Kalimantan Tengah, Indonesia. Primate Conservation, **9:** 138–146. [For date of publication, see Asian Primates, 1991, **1:** 1.]

Chivers, D. J., and G. Davies. 1979. Abundance of primates in the Krau Game Reserve, peninsular Malaysia, pp. 9–36. *In* Marshall, A. G., ed., The Abundance of Animals in Malesian Rain Forests. Department of Geography, University of Hull, and Institute of South-East Asian Biology, University of Aberdeen, [Hull].

Chivers, D. J., and J. J. Raemaekers. 1980. Long-term changes in behaviour, pp. 209–260. *In* Chivers,

D. J., ed., Malayan Forest Primates: Ten Years' Study in Tropical Rain Forest. Plenum, New York.

Cho, F. 1981. Breeding performance of the cynomolgus monkey at Tsukuba Primate Center for Medical Science. Japanese Journal of Medical Science & Biology, **34:** 252–255.

Cho, F., T. Fujiwara, S. Honjo, and K. Imaizumi. 1973. Sexual maturation of laboratory-bred male cynomolgus monkeys (*Macaca fascicularis*). Experimental Animals, Tokyo, **22:** 403–409.

Chuang, S. H. 1973. Introduction, pp. 1–6. *In* Chuang, S. H., ed., Animal Life and Nature in Singapore. Singapore University Press, Singapore.

Clark, J. A., W. E. Farrell, and W. R. Peltier. 1978. Global changes in postglacial sea level: A numerical calculation. Quaternary Research, **9:** 265–287.

Collins, W. E., McW. Warren, J. C. Skinner, and D. W. Alling. 1970. *Plasmodium inui*: Serologic relationships of Asian isolates. Experimental Parasitology, **27:** 507–515.

Coolidge, H. J., Jr. 1940. Mammal and bird collections of the Asiatic Primate Expedition. Introduction. Bulletin of the Museum of Comparative Zoology at Harvard College, **87:** 121–130.

Corbet, G. B., and J. E. Hill. 1992. The Mammals of the Indomalayan Region: A Systematic Review. Natural History Museum Publications and Oxford University Press, Oxford, 488 pp.

Corlett, R. T., and P. W. Lucas. 1990. Alternative seed-handling strategies in primates: Seed-spitting by long-tailed macaques (*Macaca fascicularis*). Oecologia, **82:** 166–171.

Corner, G. W. 1932. The menstrual cycle of the Malayan monkey, *Macaca irus*. Anatomical Record, **52:** 401–410.

Couper, A. 1989. The Times Atlas and Encyclopedia of the Sea. Times Books, London, 272 pp.

Cranbrook, Earl of. 1993. Research and management of the Batu Apoi Forest Reserve, Temburong, Brunei: The Universiti Brunei Darussalam/Royal Geographical Society Rainforest Project 1991/92. Global Ecology and Biogeography Letters, **3:** 267–276.

Crawfurd, J. 1828. Journal of an Embassy from the Governor-General of India to the Courts of Siam and Cochin China, Exhibiting a View of the Actual State of Those Kingdoms. Henry Colburn, London, 598 pp.

Crockett, C. M., and W. L. Wilson. 1980. The ecological separation of *Macaca nemestrina* and *M. fascicularis* in Sumatra, pp. 148–181. *In* Lindburg, D. G., ed., The Macaques: Studies in Ecology, Behavior and Evolution. Van Nostrand Reinhold, New York.

Crovella, S., M. P. Bigatti, G. Ardito, M. Del Pero, D. Montagnon, and L. Lamberti. 1994. The high genetic homology of three *Macaca fascicularis* and two *Macaca mulatta* subspecies on the basis of their highly repeated DNA restriction patterns. Human Evolution, **9:** 63–71.

Cuvier, F. 1818. Du macaque de Buffon. Mémoires du Muséum d'Histoire Naturelle, **4:** 109–120.

———. 1819. Le macaque, liv. 3, pp. 1–4. *In* Geoffroy Saint-Hilaire, É., and F. Cuvier, eds., Histoire Naturelle des Mammifères, vol. 1. A. Belin, Paris.

———. 1825. Macaque à face noir, liv. 52, pp. 1–2. *In* Geoffroy Saint-Hilaire, É., and F. Cuvier, eds., Histoire Naturelle des Mammifères, vol. 5. A. Belin, Paris.

Cuvier, G. 1798. Tableau Élémentaire de l'Histoire Naturelle des Animaux. Baudouin, Paris, xiv + 710 pp.

C. V. Primates (Indonesia). Ca. 1993. Deli Island breeding program [advertising leaflet]. Tangerang, Java, Indonesia, 2 pp.

Dahlbom, A. G. 1856. Studia Zoologica . . ., vol. 1, fasc. 1. Berlingianis, Lund, 240 pp.

Dammerman, K. W. 1926a. Een toch naar Soemba. Natuurkundig Tijdschrift voor Nederlandsch-Indië, **86:** 27–122.

———. 1926b. The fauna of Durian and the Rhio-Lingga Archipelago. Treubia, **8:** 281–326.

———. 1928. On the mammals of Sumba. Treubia, **10:** 299–315.

———. 1929. On the zoogeography of Java. Treubia, **11:** 1–88.

———. 1934. On prehistoric mammals from the Sampoeng cave, central Java. Treubia, **14:** 477–486.

———. 1948. The fauna of Krakatau, 1883–1933. Vehandlelingen der Koninklijke Nederlandsche Akademie van Wetenschappen, Afdeeling Natuurkunde, Tweede Sectie, **44:** 1–594.

Dampier, W. 1697. A New Voyage Round the World. Argonaut Press, London, 376 pp. (Reprint, 1927.)

Dang, D.-C. 1977. Observations recueillies au cours de l'elevage artificiel des nouveau-nés de macaque (*Macaca fascicularis*). Cahiers d'Anthropologie, **4:** 1–36.

———. 1979. Return of postpartum menstruation and fertility in laboratory *Macaca fascicularis*. Annales de Biologie Animale, Biochimie, Biophysique, **19:** 375–383.

———. 1983. La puberté femelle chez le singe *Macaca fascicularis* élevé en laboratoire: Ménarche—copulation—gestation—fertilité. Cahiers d'Anthropologie et Biométrie Humaine, **1:** 33–45.

Dang, D.-C., G. Chaouat, A. Delmas, J. Hureau, G. Hidden, and J.-P. Lassau. [1993]. Assessment of factors responsible for variability of birth weight in the long-tailed macaque (*Macaca fascicularis*). Folia Primatologica, **59:** 149–156. [For date of publication, see front cover of journal.]

Darevsky, I. S., and S. Kadarsan. 1964. On the biology of the giant Indonesian monitor (*Varanus komodoensis* Ouwens). Zoologicheskii Zhurnal, **43:** 1355–1360. (In Russian, with English summary.)

Das, P. K., and D. K. Ghosal. 1977. Notes on the Nicobar crab-eating macaque. Newsletter of the Zoological Survey of India, **3:** 264–267.

Davies, G. [1983]. Distribution, abundance and conservation of simian primates in Borneo, pp. 122–148. *In* Harper, D., ed., Conservation of Primates and Their Habitats, vol. 1. University of Leicester, Leicester. [For date of publication, see Current Primate References, 1985 (May): 9.]

Davis, D. D. 1962. Mammals of the lowland rainforest of North Borneo. Bulletin of the Singapore National Museum, **31:** 1–129.

DE BENEDICTIS, T. 1973. The behavior of young primates during adult copulation: Observations of a *Macaca irus* colony. American Anthropologist, **75:** 1469–1484.

DEIGNAN, H. G. [1960]. Henry Cusheir Raven's travels in eastern Borneo. Sarawak Museum Journal, n.s., **13-14:** 267–269. [For date of publication, see Medway, 1977, p. 154.]

DELACOUR, J. 1928. Quatrième expédition en Indochine. L'Oiseau, **9:** 257–269.

———. 1929. On the birds collected during the Fourth Expedition to French Indo-China. Ibis, 12th ser., **5:** 193–220.

DENINGER, K. 1910. Ueber einen Affenkiefer aus den Kendengschichten von Java. Centralblatt für Mineralogie, Geologie und Paläontologie, **1910:** 1–3.

DEPUTTE, B. L., AND M. GOUSTARD. 1980. Copulatory vocalizations of female macaques (*Macaca fascicularis*): Variability factors analysis. Primates, **21:** 83–99.

DE ROSSEL, É. P. É. 1829. Compte rendu au Ministre de la marine . . . des opérations faites pendant la campagne de la Chevrette, commandée par M. Fabré, et des fruits qu'on peut tirer de cette campagne. Annales Maritimes et Coloniales, Paris, II.e Partie, **1:** 607–618.

DE ROSSEL, É. P. É., C. L. MATHIEU, AND D. F. ARAGO. 1829. Rapport fait à l'Académie des sciences . . . sur les travaux relatifs aux sciences mathématiques qui ont été exécutés pendant le voyage de la Chevrette. Annales Maritimes et Coloniales, Paris, II.e Partie, **1:** 600–607.

DESMAREST, A. G. 1817. Macaque, pp. 319–329. *In* Nouveau Dictionnaire d'Histoire Naturelle, Nouvelle Édition, vol. 18. Deterville, Paris.

———. 1820. Mammalogie ou Description des Espèces de Mammifères, pt. 1. Agasse, Paris, viii + 276 pp.

DUKELOW, W. R. 1977. Ovulatory cycle characteristics in *Macaca fascicularis*. Journal of Medical Primatology, **6:** 33–42.

DUKELOW, W. R., J. GRAUWILER, AND S. BRÜGGEMANN. 1979. Characteristics of the menstrual cycle in nonhuman primates. I. Similarities and dissimilarities between *Macaca fascicularis* and *Macaca arctoides*. Journal of Medical Primatology, **8:** 39–47.

DUMOND, F. V. 1967. Semi-free-ranging colonies of monkeys at Goulds Monkey Jungle. International Zoo Yearbook, **7:** 202–207.

DUNCAN, J. F., P. F. D. VAN PEENEN, AND P. F. RYAN. 1970. Somatic chromosomes of eight mammals from Con Son Island, South Vietnam. Caryologia, **23:** 173–181.

DUNN, F. L. 1975. Rain-forest collectors and traders: A study of resource utilization in modern and ancient Malaya. Monographs of the Malaysian Branch, Royal Asiatic Society, **5:** 1–151.

EDESON, J. F. B., AND D. G. DAVEY. 1953. Isolation of a virulent strain of *Plasmodium knowlesi* Sinton and Mulligan, 1932. Transactions of the Royal Society of Tropical Medicine and Hygiene, **47:** 259–260.

ELBERT, J. 1911. Die Sunda-Expedition des Vereins für Geographie und Statistik zu Frankfurt am Main, vol. 1. Hermann Minjon, Frankfurt am Main, 274 pp.

———. 1912. Die Sunda-Expedtion des Vereins für Geographie und Statistik zu Frankfurt am Main, vol. 2. Hermann Minjon, Frankfurt am Main, 373 pp.

ELLIOT, D. G. 1906. Descriptions of an apparently new species of monkey of the genus *Presbytis* from Sumatra, and of a bat of the genus *Dermanura* from Mexico. Proceedings of the Biological Society of Washington, **19:** 49–50.

———. 1909. Descriptions of apparently new species and subspecies of monkeys of the genera *Callicebus, Lagothrix, Papio, Pithecus. Cercopithecus, Erythrocebus,* and *Presbytis*. Annals and Magazine of Natural History, 8th ser., **4:** 244–274.

———. 1910. Descriptions of some new species of monkeys of the genera *Pithecus* and *Pygathrix* collected by Dr. W. L. Abbott and presented to the United States National Museum. Proceedings of the United States National Museum, **38:** 343–352.

———. 1913. A Review of the Primates, vol. 2. American Museum of Natural History, New York, xviii + 382 + xxvi pp. [For date of publication, see Correction, between pp. ii and iii.]

EMORY, G. R., AND S. J. HARRIS. 1978. On the directional orientation of female presents in *Macaca fascicularis*. Primates, **19:** 227–229.

EMORY, G. R., S. J. HARRIS, AND R. G. PAYNE. 1980. Sexual solicitation by females in long-tailed macaques (*Macaca fascicularis*). Biology of Behaviour, **5:** 249–252.

ERWIN, J. 1977. Infant mortality in *Macaca fascicularis*: Neonatal and post-neonatal mortality at the Regional Primate Research Center Field Station, University of Washington, 1967–1976. Theriogenology, **7:** 357–366.

ERXLEBEN, J. C. P. 1777. Systema Regni Animalis per Classes, Ordines, Genera, Species, Varietates cum Synonymia et Historia Animalium. Classis I. Mammalia. Impensis Weygandianis, Lipsiae, xlviii + 636 pp.

EUDEY, A. A. 1979. Differentiation and dispersal of macaques (*Macaca* spp.) in Asia. Dissertation, Department of Anthropology, University of California, Davis, 241 pp.

———. 1980. Pleistocene glacial phenomena and the evolution of Asian macaques, pp. 52–83. *In* Lindburg, D. G., ed., The Macaques: Studies in Ecology, Behavior and Evolution. Van Nostrand Reinhold, New York.

———. 1994. Temple and pet primates in Thailand. Revue d'Ecologie (Terre & Vie), **49:** 273–280.

EYDOUX, J. F. T., AND L. SOULEYET [AND P. GERVAIS]. 1841. Voyage Autour du Monde Exécuté Pendant les Années 1836 et 1837 sur la Corvette la Bonite: Zoologie, vol. 1. Arthus Bertrand, Paris, xxxix + 328 pp. [For name of third author, see pp. ii, 3.]

EYLES, D. E., R. H. WHARTON, W. H. CHEONG, AND MCW. WARREN. 1964. Studies on malaria and *Anopheles balabacensis* in Cambodia. Bulletin of the World Health Organization, **30:** 7–21.

FA, J. E. 1989. The genus *Macaca*: A review of taxonomy and evolution. Mammal Review, **18:** 45–81.

FAIRBANKS, R. G. 1989. A 17,000-year glacio-eustatic sea level record: Influence of glacial melting rates on

the Younger Dryas event and deep-ocean circulation. Nature, **342:** 637–642.

FISCHER, J. B. 1829. Synopsis Mammalium. J. G. Cotta, Stuttgart, xlii + 527 pp.

FITTINGHOFF, N. A., JR., AND D. G. LINDBURG. 1980. Riverine refuging in East Bornean *Macaca fascicularis*, pp. 182–214. *In* Lindburg, D. G., ed., The Macaques: Studies in Ecology, Behavior and Evolution. Van Nostrand Reinhold, New York.

FITZINGER, L. J. 1861. Die Ausbeute der österreichischen Naturforscher an Säugetherien und Reptilien während der Weltumsegelung Sr. Majestät Fregatte Novara. Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften, Mathematisch-Naturwissenschaftliche Classe, **42:** 383–416.

FLEAGLE, J. G. 1980. Locomotion and posture, pp. 191–207. *In* Chivers, D. J., ed., Malayan Forest Primates: Ten Years' Study in Tropical Rain Forest. Plenum, New York.

FLOWER, S. S. 1900. On the Mammalia of Siam and the Malay Peninsula. Proceedings of the Zoological Society of London, **1900:** 306–379.

FOODEN, J. 1964. Rhesus and crab-eating macaques: Intergradation in Thailand. Science, **143:** 363–365.

———. 1969. Taxonomy and evolution of the monkeys of Celebes (Primates: Cercopithecidae). Bibliotheca Primatologica, **10:** 1–148.

———. 1971. Report on primates collected in western Thailand January–April, 1967. Fieldiana: Zoology, **59:** 1–62.

———. 1975. Taxonomy and evolution of liontail and pigtail macaques (Primates: Cercopithecidae). Fieldiana: Zoology, **67:** 1–168.

———. [1975]. Primates obtained in peninsular Thailand June–July, 1973, with notes on the distribution of continental Southeast Asian leaf-monkeys (*Presbytis*). Primates, **17:** 93–118. [For date of publication, see outside back cover.]

———. 1976. Provisional classification and key to living species of macaques (Primates: *Macaca*). Folia Primatologica, **25:** 225–236.

———. 1980. Classification and distribution of living macaques (*Macaca* Lacépède, 1799), pp. 1–9. *In* Lindburg, D. G., ed., The Macaques: Studies in Ecology, Behavior and Evolution. Van Nostrand Reinhold, New York.

———. 1982. Ecogeographic segregation of macaque species. Primates, **23:** 574–579.

———. 1991. Systematic review of Philippine macaques (Primates, Cercopithecidae: *Macaca fascicularis* subspp.). Fieldiana: Zoology, n.s., **64:** 1–44.

———. 1944. Malaria in macaques. International Journal of Primatology, **15:** 573–596.

FOODEN, J., AND G. H. ALBRECHT. 1993. Latitudinal and insular variation of skull size in crab-eating macaques (Primates, Cercopithecidae: *Macaca fascicularis*). American Journal of Physical Anthropology, **92:** 521–538.

FOODEN, J., AND S. M. LANYON. 1989. Blood-protein allele frequencies and phylogenetic relationships in *Macaca*: A review. American Journal of Primatology, **17:** 209–241.

FORBES, H. O. 1885. A Naturalist's Wanderings in the Eastern Archipelago. Sampson, Low, Marston, Searle & Rivington, London, 536 pp.

FRECHKOP, S. 1934. Notes sur les mammifères. XVI. Les mammifères rapportés, en 1932, de Extrême-Orient par S. A. R. le Prince Léopold de Belgique. Bulletin du Musée Royal d'Histoire Naturelle de Belgique, **10:** 19–37.

FUCHS, S. 1973. The Aboriginal Tribes of India. St. Martin's Press, New York, 308 pp.

FUJIWARA, N. 1963. Age changes in the skull of the crab-eating monkey. Primates, **4:** 53–77.

FUJIWARA, T., AND T. IMAMICHI. 1966. Breeding of cynomolgus monkeys as an experimental animal. Japanese Journal of Medical Science & Biology, **19:** 225–226.

FUJIWARA, T., I. UCHINO, S. HONJO, K. IMAIZUMI, AND T. IMAMICHI. 1967. Normal range of the menstrual cycle of cynomolgus monkeys under laboratory conditions. Japanese Journal of Medical Science & Biology, **20:** 505–507.

FURNESS III, W. H. 1896. Glimpses of Borneo. Proceedings of the American Philosophical Society, Philadelphia, **35:** 309–320.

FURUYA, Y. 1961–1962a. On the ecological survey of the wild crab-eating monkeys in Malaya. Primates, **3:** 73–76.

———. 1961–1962b. The social life of the silvered leaf monkeys *Trachypithecus cristatus*. Primates, **3:** 41–60.

———. 1962. Studies on the dermatoglyphics of the macaques. Proceedings of the Japan Academy, **38:** 377–386.

———. 1965. Social organization of the crab-eating monkey. Primates, **6:** 285–336.

GAIRDNER, K. G. 1914. Notes on the fauna and flora of Ratburi and Petchaburi districts. Journal of the Natural History Society of Siam, **1:** 27–40.

GALDIKAS, B. M. F., AND C. P. YEAGER. 1984. Crocodile predation on a crab-eating macaque in Borneo. American Journal of Primatology, **6:** 49–51.

GARNHAM, P. C. C. 1963. A new subspecies of *Plasmodium knowlesi* in the long-tailed macaque. Journal of Tropical Medicine and Hygiene, **66:** 156–158.

GEOFFROY SAINT-HILAIRE, É. 1803. Catalogue des Mammifères du Muséum National d'Histoire Naturelle. Paris, 272 pp.

———. 1812. Tableau des quandrumanes, ou des animaux composant le premier ordre de la classe des mammifères. Annales de Muséum d'Histoire Naturelle, **19:** 85–122.

GEOFFROY SAINT-HILAIRE, I. 1826. Macaque, pp. 584–590. *In* Bory de Saint-Vincent, ed., Dictionnaire Classique d'Historie Naturelle. Rey et Gravier and Baudouin Frères, Paris.

———. [1831]. Mammifères, pp. 1–160. *In* Bélanger, C., Voyage aux Indes-Orientales .... Arthus Bertrand, Paris. [For date of publication, see Sherborn, C. D., and B. B. Woodward, 1901, Annals and Magazine of Natural History, 7th ser., **7:** 390.]

———. [1843]. Description des mammifères nouveaux ou imparfaitement connus .... Premier mémoire.

Famille des singes. Archives du Muséum, **2:** 485–592. [For date of publication, see Geoffroy, I., 1851, p. vj.]

———. 1851. Catalogue Méthodique de la Collection des Mammifères . . . . Gide et Baudry, Paris, xv + vji + 96 pp.

GERVAIS, P. 1854. Histoire Naturelle des Mammifères . . . , vol. 1. L. Curmer, Paris, [420] pp.

GHIGLIERI, M. P. 1986. A river journey through Gunung Leuser National Park, Sumatra. Oryx, **20:** 104–110.

GIBSON-HILL, C. A. 1949. Bird and mammal type specimens formerly in the Raffles Museum collections. Bulletin of the Raffles Museum, Singapore, **19:** 133–198.

GLOVER, I. 1986. Archaeology of eastern Timor. Terra Australis, **11:** i–xxi, 1–241.

GOODMAN, A. L., C. D. DESCALZI, D. K. JOHNSON, AND G. D. HODGEN. 1977. Composite pattern of circulating LH, FSH, estradiol, and progesterone during the menstrual cycle in cynomolgus monkeys Proceedings of the Society for Experimental Biology and Medicine, **155:** 479–481.

GOUSTARD, M. 1961. La structure sociale d'une colonie de "*Macaca irus.*" Annales des Sciences Naturelles, Zoologie, 12th ser., **3:** 297–322.

———. 1963. Introduction a l'étude de la communication vocale chez *Macaca irus.* Annales des Sciences Naturelles, Zoologie, 12th ser., **5:** 707–747.

———. 1968. La séquence d'activités liées a la copulation chez le macaque crabier *Macaca irus.* Annales des Sciences Naturelles, Zoologie, 12th ser., **10:** 463–474.

GRATTON, N. E. 1992. Nicobarese, pp. 208–210. *In* Hockings, P., ed., Encyclopedia of World Cultures, vol. III. South Asia. G. K. Hall & Co., Boston.

GRAY, J. E. 1849. Vertebrata, pp. 1–43. *In* Adams, A., ed., The Zoology of the Voyage of H.M.S. Samarang . . . . Reeve, Benham, and Reeve, London.

———. 1870. Catalogue of Monkeys, Lemurs, and Fruit-Eating Bats in the Collection of the British Museum. British Museum, London, 137 pp.

GRIFFITH, E. 1821. General and Particular Descriptions of the Vertebrated Animals . . . Order Quadrumana. Baldwin, Cradock, and Joy and Rodwell and Martin, London, 143 pp.

GRISWOLD, J. A. 1939a. Up Mount Kinabalu. I. White man and natives begin ascent. Scientific Monthly, **48:** 401–414.

———. 1939b. Up Mount Kinabalu. II. Camping and collecting in Lumu Lumu and beyond. Scientific Monthly, **48:** 504–518.

GROVES, C. P. 1993. Order Primates, pp. 243–277. *In* Wilson, D. E., and D. M. Reeder, eds., Mammal Species of the World: A Taxonomic and Geographic Reference, 2nd ed. Smithsonian Institution Press, Washington, D.C.

GURMAYA, K. J. 1989. Ecology, behavior and sociality of Thomas' leaf monkey in North Sumatra. Comparative Primatology Monographs, **2:** 53–170.

GYLDENSTOLPE, N. 1913. Birds collected by the Swedish Zoological Expedition to Siam 1911–12. Kungliga Svenska Vetenskapsakademiens Handlingar, **50**(8): 1–76.

———. 1914. Mammals collected, or observed by the Swedish Zoological Expedition to Siam 1911–1912. Arkiv för Zoologi, **8**(23): 1–36.

———. 1916. Zoological results of the Swedish Zoological Expeditions to Siam 1911–1912 & 1914–1915. IV. Birds II. Kungliga Svenska Vetenskapsakademiens Handlingar, **56**(2): 1–160.

———. 1917a. On birds and mammals from the Malay Peninsula. Arkiv för Zoologi, **10**(26): 1–31.

———. 1917b. Zoological results of the Swedish Zoological Expeditions to Siam 1911–1912 & 1914–1915. V. Mammals II. Kungliga Svenska Vetenskapsakademiens Handlingar, **57**(2): 1–59.

———. 1919. A list of the mammals at present known to inhabit Siam. Journal of the Natural History Society of Siam, **3:** 127–175.

———. 1920. On a collection of mammals made in eastern and central Borneo by Mr. Carl Lumholtz. Kungliga Svenska Vetenskapsakademiens Handlingar, **60**(6): 1–62. [For date of publication, see p. 62.]

HADIDIAN, J., AND I. S. BERNSTEIN. 1979. Female reproductive cycles and birth data from an Old World monkey colony. Primates, **20:** 429–442.

HAGEN, B. 1890. Die Pflanzen- und Thierwelt von Deli auf der Ostküste Sumatra's: Naturwissenschlaftliche Skizzen und Beiträge. Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap, 2nd ser., **7:** 1–240.

HALGRIMSSON, B. 1993. Fluctuating asymmetry in *Macaca fascicularis*: A study of the etiology of developmental noise. International Journal of Primatology, **14:** 421–443.

HARIHARA, S., N. AOTO, M. HIRAI, K. TERAO, F. CHO, S. HONJO, AND K. OMOTO. 1986. Polymorphism in the mitochondrial DNA of cynomolgus monkeys. Primates, **27:** 357–361.

HARIHARA, S., T. INANISHI, N. SAITOU, K. OMOTO, P. VARAVUDHI, AND O. TAKENAKA. 1991. Phylogenetic analysis of *Macaca fascicularis* in Thailand, using data of mitochondrial DNA, pp. 611–612. *In* Ehara, A., T. Kimura, O. Takenaka, and M. Iwamoto, eds., Primatology Today: Proceedings of the XIIIth Congress of the International Primatological Society, Nagoya and Kyoto, 18–24 July 1990. Elsevier Science, Amsterdam.

HARIHARA, S., N. SAITOU, M. HIRAI, N. AOTO, K. TERAO, F. CHO, S. HONJO, AND K. OMOTO. 1988. Differentiation of mitochondrial DNA types in *Macaca fascicularis.* Primates, **29:** 117–127.

HARRISON, J. L. 1961. The natural food of some Malayan mammals. Bulletin of the National Museum, State of Singapore, **30:** 5–18.

———. 1969. The abundance and population density of mammals in Malayan lowland forests. Malayan Nature Journal, **22:** 174–178.

HARRISON, J. L., AND J. R. HENDRICKSON. 1963. The fauna of the islands of the Straits of Malacca, pp. 543–555. *In* Gressitt, J. L., ed., Pacific Basin Biogeography: A Symposium. Bishop Museum Press, Honolulu.

HARRISSON, T. H. 1933. The Oxford University Ex-

pedition to Sarawak. Geographical Journal, **82:** 386–410.

HARTERT, E. 1896. List of a collection of birds made in Lombok by Mr. Alfred Everett. Novitates Zoologicae, **3:** 591–599.

HAYAMI, M., K. ISHIKAWA, A. KOMURO, Y. KAWAMOTO, K. NOZAWA, K. YAMAMOTO, T. ISHIDA, AND Y. HINUMA. 1983. ATLV antibody in cynomolgus monkeys in the wild. Lancet, **1983**(2): 620.

HAYAMI, M., A. KOMURO, K. NOZAWA, T. SHOTAKE, K. ISHIKAWA, K. YAMAMOTO, T. ISHIDA, S. HONJO, AND Y. HINUMA. 1984. Prevalence of antibody to adult T-cell leukemia virus-associated antigens (ATLA) in Japanese monkeys and other non-human primates. International Journal of Cancer, **33:** 179–183.

HEANEY, L. R. 1984. Mammalian species richness on islands on the Sunda Shelf, Southeast Asia. Oecologia, **61:** 11–17.

———. 1986. Biogeography of mammals in SE Asia: Estimates of rates of colonization, extinction and speciation. Biological Journal of the Linnaean Society, **28:** 127–165.

———. 1991a. A synopsis of climatic and vegetational change in Southeast Asia. Climatic Change, **19:** 53–61.

———. 1991b. An analysis of patterns of distribution and species richness among Philippine fruit bats (Pteropidae). Bulletin of the American Museum of Natural History, **206:** 145–167.

HELFER, J. E. 1838. Notes on animal productions of the Tenasserim Provinces. Journal of the Asiatic Society of Bengal, Calcutta, **7:** 855–863.

HELLMAYR, C. E. 1914. Die Avifauna von Timor, pp. 1–112. *In* Haniel, C. B., ed., Zoologie von Timor . . . . I. Lieferung. Kommissionsverlag der E. Schweizerbartschen Verlagsbuchhandlung, Nägele und Dr. Sproesser, Stuttgart.

HEURN, J. W. C. VAN. 1932. Vluchtige zoölogische waarnemingen, gedaam tijdens een kort verblijf op Timor en Flores, Apri–Mei, 1930. Natuurkundig Tijdschrift voor Nederlandsch-Indië, **92:** 64–82.

HICKSON, S. J. 1889. A Naturalist in North Celebes . . . . John Murray, London, 392 pp.

HILL, J. E. 1960. The Robinson collection of Malaysian mammals. Bulletin of the Raffles Museum, Singapore, **29:** 1–112.

HILL, W. C. O. 1974. Primates: Comparative Anatomy and Taxonomy. VII. Cynopithecinae: *Cercocebus, Macaca, Cynopithecus.* John Wiley & Sons, New York, xxi + 934 pp.

HILLER, H. M. 1896. A brief report of a journey up the Rejang River in Borneo. Proceedings of the American Philosophical Society, Philadelphia, **35:** 321–328.

HIRAI, M., K. TERAO, F. CHO, AND S. HONJO. 1991. Chromosome studies on cynomolgus monkeys (*Macaca fascicularis*), pp. 619–622. *In* Ehara, A., T. Kimura, O. Takenaka, and M. Iwamoto, eds., Primatology Today: Proceedings of the XIIIth Congress of the International Primatological Society, Nagoya and Kyoto, 18–24 July 1990. Elsevier Science, Amsterdam.

HODGKIN, E. P. 1950. The *Anopheles umbrosus* group (Diptera: Culicidae). Part II: Biology and transmission of malaria. Transactions of the Royal Entomological Society of London, **101:** 319–334.

HOHMANN, G., AND W. P. PETER. 1983. Ujung-Kulan-Nationalpark. Zeitschrift des Kölner Zoo, **26**(2): 39–47.

———. 1986. Samunsam Wildlife Sanctuary—Ein Reservat für Nasenaffen (*Nasalis larvatus*). Zeitschrift des Kölner Zoo, **29**(3): 87–93.

HOLLISTER, N. 1912. A list of the mammals of the Philippine Islands, exclusive of the Cetacea. Philippine Journal of Science, ser. D, **7:** 1–64.

———. 1913. A review of the Philippine land mammals in the United States National Museum. Proceedings of the United States National Museum, **46:** 299–341.

HONJO, S., F. CHO, AND K. TERAO. 1984. Establishing the cynomolgus monkey as a laboratory animal. Advances in Veterinary Science and Comparative Medicine, **28:** 51–80.

HOOGERWERF, A. 1941. The birds of The Netherlands Indian Mt. Leuser Expedition 1937 to North Sumatra. 3. Itinerary. Treubia, **18**(suppl.): 5–8.

———. 1954. Nature protection in Indonesia. Oryx, **2:** 221–227.

———. 1955. Le lézard géant de Komodo. Science et Nature, **9:** 22–27.

———. 1970. Udjung Kulon: The Land of the Last Javan Rhinoceros. E. J. Brill, Leiden, 512 pp.

———. 1974. Report on a visit to wildlife reserves in East Java, Indonesia (August to November, 1971), pp. 1–51. *In* Nederlandsche Commissie voor Internationale Natuurbescherming, Mededelingen No. 21. Austerlitz, Holland.

HOOGSTRAAL, H. 1951. Philippine Zoological Expedition 1946–1947: Narrative and itinerary. Fieldiana: Zoology, **33:** 1–86.

HOOIJER, D. A. 1962a. Prehistoric bone: The gibbons and monkeys of Niah Great Cave. Sarawak Museum Journal, n.s., **11:** 428–449.

———. 1962b. Quaternary langurs and macaques from the Malay Archipelago. Zoologische Verhandelingen Uitgegeven door het Rijksmuseum van Natuurlijke Historie te Leiden, **55:** 1–64.

———. 1964. New records of mammals from the Middle Pleistocene of Sangiran, central Java. Zoologische Mededelingen Uitgegeven door het Rijksmuseum van Natuurlijke Historie te Leiden, **40:** 73–88.

———. 1967. Appendix II. Mammalian remains from Liang Toge, Flores, pp. 160–161. *In* Jacob, T., Some Problems Pertaining to the Racial History of the Indonesian Region. Thesis, Utrecht University, Utrecht.

HOOPES, C. 1984. Morphological variation, selection, and the transferrin locus in *Macaca fascicularis.* American Journal of Physical Anthropology, **63:** 171. (Abstract only.)

HORNADAY, W. T. 1910. Two Years in the Jungle: The Experiences of a Hunter and Naturalist in India, Ceylon, the Malay Peninsula and Borneo. Charles Scribner's Sons, New York, 512 pp.

HORSFIELD, T. [1840]. List of Mammalia and birds

collected in Assam by John McClelland. Proceedings of the Zoological Society of London, **1839:** 146–167. [For date of publication, see Duncan, F. M., 1937, Proceedings of the Zoological Society of London, ser. A, **107:** 79.]

———. 1851. A Catalogue of the Mammalia in the Museum of the Hon. East-India Company. Honourable East-India Company, London, vi + 212 pp.

Hose, C. 1893. A Descriptive Account of the Mammals of Borneo. Edward Abbott, London, 78 pp.

Hubrecht, A. A. W. [1895]. Embryologisch onderzoek van zoogdieren uit Nederlandsch-Indië . . . . Natuurkundig Tijdschrift voor Nederlandsch-Indië, **54:** 25–90. [For date of publication, see Ruch, T. C., 1941, Bibliographica Primatologica, Charles C Thomas, Springfield, Illinois, p. 16.]

Hume, A. O., and W. Davison. 1878. A revised list of the birds of Tenasserim, Stray Feathers, **6:** i–viii, 1–524.

International Code of Zoological Nomenclature, 3rd ed. 1985. International Trust for Zoological Nomenclature, London, xx + 338 pp.

International Commission on Zoological Nomenclature. 1986. Opinion 1400. *Simia fascicularis* Raffles, 1821 (Mammalia, Primates): Conserved. Bulletin of Zoological Nomenclature, **43:** 229–230.

Ishida, T., and P. Varavudhi. 1992. Wild long-tailed macaques (*Macaca fascicularis*) in Thailand are highly infected with gamma herpes virus but not with simian T-lymphotropic retrovirus of type 1. Folia Primatologica, **59:** 163–168.

Ishida, T., K. Yamamoto, G. Ishimoto, T. Shotake, O. Takenaka, K. Nozawa, M. Hayami, and Y. Hinuma. 1985. A field study of infection with human T-cell leukemia virus among Asian primates. Microbiology and Immunology, **29:** 839–846.

IUCN. 1971. United Nations List of National Parks and Equivalent Reserves, 2nd ed. Hayez, Brussels, 601 pp.

Jacobson, E. 1913. Simaloer van thans. Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap, 2nd ser., **30:** 356–357.

———. 1917. Het eiland Simaloer. Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap, 2nd ser., **34:** 265–277.

Jentink, F. A. 1897. Zoological results of the Dutch Scientific Expedition to Central Borneo. The mammals. Notes from the Leyden Museum, **19:** 26–66.

Joachimovitz, R. 1928. Studien zu Menstruation, Ovulation, Aufbau und Pathologie des weiblichen Genitales bei Mensch und Affe (*Pithecus fascicularis mordax*). Biologia Generalis, **4:** 447–540.

Johns, A. D. 1981. The effects of selective logging on the social structure of resident primates. Malaysian Applied Biology, **10:** 221–226.

———. 1986a. Effects of selective logging on the behavioral ecology of West Malaysian primates. Ecology, **67:** 684–694.

———. 1986b. The effects of commercial logging on a West Malaysian primate community, pp. 206–211. *In* Taub, D. M., and F. A. King, eds., Current Perspectives in Primate Social Dynamics. Van Nostrand Reinhold, New York.

———. 1992. Vertebrate responses to selective logging: Implications for the design of logging systems. Philosophical Transactions of the Royal Society of London, ser. B, **335:** 437–442.

Joines, S. 1981. Sarawak's Samunsam Sanctuary. Zoonooz, San Diego, **54**(5): 5–9.

Jones, F. W. 1910. Corals and Atolls . . . . Lovell Reeve & Co., London, ix + 392 pp.

Jones, M. L. 1982. Longevity of captive mammals. Zoologische Garten, n.s., **52:** 113–128.

Kalra, N. L. 1980. Emergence of malaria zoonosis of simian origin as natural phenomenon in Greater Nicobars, Andaman & Nicobar Islands—A preliminary note. Journal of Communicable Diseases, **12:** 49–54.

Kanagawa, H., and E. S. E. Hafez. 1973. Copulatory behavior in relation to anatomical characteristics of three macaques. American Journal of Physical Anthropology, **38:** 233–240.

Kanagawa, H., E. S. E. Hafez, M. M. Nawar, and S. Jaszczak. 1972. Patterns of sexual behavior and anatomy of copulatory organs in macaques. Zeitschrift für Tierpsychologie, **31:** 449–460.

Karrer, R. 1970. The use of the tail by an Old World monkey. Primates, **11:** 171–175.

Karssemeijer, G. J., D. R. Vos, and J. A. R. A. M. van Hooff. 1990. The effect of some non-social factors on mother–infant contact in long-tailed macaques (*Macaca fascicularis*). Behaviour, **113:** 273–291.

Kavanagh, M. 1982. Good news about orang-utans in Sarawak. Oryx, **16:** 320–321.

Kavanagh, M., and E. Laursen. 1984. Breeding seasonality among long-tailed macaques, *Macaca fascicularis,* in peninsular Malaysia. International Journal of Primatology, **5:** 17–29.

Kawabe, M., and T. Mano. 1972. Ecology and behavior of the wild proboscis monkey, *Nasalis larvatus* (Wurmb), in Sabah, Malaysia. Primates, **13:** 213–227.

Kawamoto, Y. 1982. A reexamination of electromorphs of plasma transferrin in the Indonesian crab-eating macaque (*Macaca fascicularis*). Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **2:** 65–73.

Kawamoto, Y., and Tb. M. Ischak. 1981. Genetic differentiation of the Indonesian crab-eating macaque (*Macaca fascicularis*): I. Preliminary report on blood protein polymorphism. Primates, **22:** 237–252.

Kawamoto, Y., Tb. M. Ischak, and J. Supriatna. 1982a. Gene constitution of crab-eating macaques (*Macaca fascicularis*) on Lombok and Sumbawa. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **2:** 57–64.

———. 1984. Genetic variations within and between troops of the crab-eating macaque (*Macaca fascicularis*) on Sumatra, Java, Bali, Lombok and Sumbawa, Indonesia. Primates, **25:** 131–139.

Kawamoto, Y., T. Ishida, J. Suzuki, O. Takenaka, and P. Varavudhi. 1989. A preliminary report on the genetic variations of crab-eating macaques in Thailand. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **7:** 94–103.

KAWAMOTO, Y., K. NOZAWA, AND TB. M. ISCHAK. 1981. Genetic variability and differentiation of local populations in the Indonesian crab-eating macaque (*Macaca fascicularis*). Kyoto University Overseas Research Report of Studies on Indonesian Macaque, **1:** 15–39.

KAWAMOTO, Y., K. NOZAWA, TB. M. ISCHAK, J. SUPRIATNA, B. SURYOBROTO, AND P. VARAVUDHI. 1991. Evolution and genetic differentiation of the crab-eating macaque, pp. 599–600. *In* Ehara, A., T. Kimura, O. Takenaka, and M. Iwamoto, eds., Primatology Today: Proceedings of the XIIIth Congress of the International Primatological Society, Nagoya and Kyoto, 18–24 July 1990. Elsevier Science, Amsterdam.

KAWAMOTO, Y., K. NOZAWA, K. MATSUBAYASHI, AND S. GOTOH. 1987. Reports on the crab-eating monkey in Angaur. III. Genetic variation. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **6:** 97–102.

———. 1988. A population-genetic study of crab-eating macaques (*Macaca fascicularis*) on the island of Angaur, Pulau, Micronesia. Folia Primatologica, **51:** 169–181.

KAWAMOTO, Y., T. SHOTAKE, AND K. NOZAWA. 1982b. Genetic differentiation among three genera of family Cercopithecidae. Primates, **23:** 272–286.

KAWAMOTO, Y., AND B. SURYOBROTO. 1985. Gene constitution of crab-eating macaques on Timor. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **4:** 35–40.

KELLOGG, R. 1944. A new macaque from an island off the east cost of Borneo. Proceedings of the Biological Society of Washington, **57:** 75–76.

———. 1945. Macaques, pp. 113–134. *In* Aberle, S. D., ed., Primate Malaria. National Research Council, Division of Medical Science, Office of Medical Information, Washington, D.C.

KELSALL, H. J. 1894a. Account of a trip up the Pahang, Tembeling, and Tahan rivers, and an attempt to reach Gunong Tahan. Journal of the Straits Branch of the Royal Asiatic Society, **25:** 33–49.

———. 1894b. A journey on the Sembrong River from Kuala Indau to Batu Pahat. Personal account of the journey. List of mammals collected or observed during trip. Journal of the Straits Branch of the Royal Asiatic Society, **26:** 1–17.

KEMPS, A., AND P. TIMMERMANS. 1982. Parturition behaviour in pluriparous Java-macaques (*Macaca fascicularis*). Primates, **23:** 75–88.

KERBER, W. T., AND W. H. REESE. 1969. Comparison of the menstrual cycle of cynomolgus and rhesus monkeys. Fertility and Sterility, **20:** 975–979.

KERN, J. A. 1964. Observations on the habits of the proboscis monkey, *Nasalis larvatus* (Wurmb), made in the Brunei Bay area, Borneo. Zoologica, **49:** 183–192.

KHAJURIA, H. [1955]. Catalogue of mammals in the Indian Museum (Zool. Surv.). II. Primates: Cercopithecidae. Records of the Indian Museum, **52:** 101–127. [For date of publication, see Khajuria, H., 1956, Records of the Indian Museum, **52:** 195.]

KHAN, M. A. R. 1981. The non-human primates of Bangladesh. Tigerpaper, **8**(1): 12–15.

———. 1985. Mammals of Bangladesh. Nazma Reza, Dhaka, 92 pp.

KHAN, M. A. R., AND M. A. WAHAB. 1983. Study of eco-ethology of the crabeating macaque, *Macaca fascicularis* in Bangladesh. Journal of the Asiatic Society of Bangladesh (Science), **9:** 101–109.

KHAN, M. K. B. M. 1988. Animal conservation strategies, pp. 251–272. *In* Cranbrook, Earl of, ed., Key Environments: Malaysia. Pergamon, Oxford.

KING, J. 1784. A Voyage to the Pacific Ocean . . . Performed under the Direction of Captains Cook, Clerke, and Gore . . . , vol. 3. Lord Commissioners of the Admiralty, London, 558 pp.

KITCHENER, D. J., BOEADI, L. CHARLTON, AND MAHARADATUNKAMSI. 1990. Wild Mammals of Lombok Island: Nusa Tenggara, Indonesia: Systematics and Natural History. Western Australian Museum, Perth, 129 pp.

KLOSS, C. B. 1903a. In the Andamans and Nicobars . . . . John Murray, London, xiii + 373 pp.

———. 1903b. Notes on a cruise in the Southern China Sea. Journal of the Straits Branch of the Royal Asiatic Society, Singapore, **41:** 53–80.

———. 1908. Some visits to Batam Island. Journal of the Straits Branch of the Royal Asiatic Society, Singapore, **50:** 61–71.

———. 1911a. On a collection of mammals and other vertebrates from the Trengganu Archipelago. Journal of the Federated Malay States Museums, **4:** 175–212.

———. 1911b. On new mammals from the Trengganu Archipelago. Annals and Magazine of Natural History, 8th ser., **7:** 115–119.

———. 1915a. On two new squirrels from the Inner Gulf of Siam. Journal of the Natural History Society of Siam, **1:** 157–162.

———. 1915b. On two new rats from the Inner Gulf of Siam. Journal of the Natural History Society of Siam, **1:** 221–224.

———. 1916a. On a collection of mammals from Siam. Journal of the Natural History Society of Siam, **2:** 1–32.

———. 1916b. On a collection of mammals from the coast and islands of Siam. Proceedings of the Zoological Society of London, **1916:** 27–75.

———. 1917. On a third collection of Siamese mammals. Journal of the Natural History Society of Siam, **2:** 288–318.

———. 1919a. On a fourth collection of Siamese mammals. Journal of the Natural History Society of Siam, **3:** 49–56.

———. 1919b. On birds from South Annam and Cochin China. Part I. Phasianidae—Campophagidae. Narrative of the journey. Ibis, 11th ser., **1:** 392–402.

———. 1919c. On mammals collected in Siam. Journal of the Natural History Society of Siam, **3:** 333–407.

———. 1921. The Pulo Condore group and its mammals. Journal of the Natural History Society of Siam, **4:** 73–83.

———. 1926. Mammals from Pulo Condore, with descriptions of two new subspecies. Journal of the Siam Society, Natural History Supplement, **6:** 357–359.

———. [1928]. Spolia Mentawiensia.—Mammals. Introduction. Proceedings of the Zoological Society of London, **1927:** 797–807. [For date of publication, see Proceedings of the Zoological Society of London, **1928:** 268.]

———. 1930. On mammals from the Raheng district, Western Siam. Introduction. Journal of the Siam Society, Natural History Supplement, **8:** 61–63.

KOENIGSWALD, G. H. R. VON. 1951. Morphology of Solo man. Introduction. Anthropological Papers of the American Museum of Natural History, **43:** 211–221.

KOHLBRUGGE, J. H. F. 1896a. Bijdragen tot de natuurlijke geschiedensis van menschen en dieren. III. Zoogdieren van zuid-oost Borneo. Natuurkunding Tijdschrift voor Nederladsch-Indië, **55:** 176–200.

———. 1896b. Bijdragen tot de natuurlijke geschiedensis van menschen en dieren. IV. Zoogdieren van den Tengger. Natuurkundig Tijdschrift voor Nederladsch-Indië, **55:** 261–298.

———. 1902. Schadelmasse bei Affen und Halbaffen. Zeitschrift für Morphologie und Anthropologie, **4:** 318–344.

KONDO, M., Y. KAWAMOTO, K. NOZAWA, K. MATSUBAYASHI, T. WATANABE, O. GRIFFITHS, AND M.-A. STANLEY. 1991. A report on the genetic variability and constitution of crab-eating macaques (*Macaca fascicularis*) on the island of Mauritius. Kyoto University Overseas Research Report of Studies of Asian Non-Human Primates, **8:** 17–25.

———. 1993. Population genetics of crab-eating macaques (*Macaca fascicularis*) on the island of Mauritius. American Journal of Primatology, **29:** 167–182.

KOOL, K. M. 1992. The status of endangered primates in Gunung Halimun Reserve, Indonesia. Oryx, **26:** 29–33.

KOYAMA, N. 1984. Socio-ecological study of the crab-eating monkeys at Gunung Meru, Indonesia. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **3:** 17–36.

———. 1985. Socio-ecological study of the crab-eating monkeys at Gunung Meru, West Sumatra. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **4:** 105–126.

KOYAMA, N., A. ASUAN, AND N. NATSIR. 1981. Socio-ecological study of the crab-eating monkeys in Indonesia. Kyoto University Overseas Research Report of Studies on Indonesian Macaque, **1:** 1–10.

KUENEN, P. H. 1947. Two problems of marine geology: Atolls and canyons. Verhandelingen der Koninklijke Nederlandsche Akademie van Wetenschappen, Afdeeling Natuurkunde, Tweede Sectie, **43**(3): 1–69.

KUNTZ, R. E. 1969. Vertebrates taken for parasitological studies by U. S. Naval Medical Research Unit No. 2 Expedition to North Borneo (Malaysia). Quarterly Journal of the Taiwan Museum, **22:** 191–206.

KURLAND, J. A. 1973. A natural history of kra macaques (*Macaca fascicularis* Raffles, 1821) at the Kutai Reserve, Kalimantan Timur, Indonesia. Primates, **14:** 245–262.

KURT, F. 1973. Der Gunung Leuser Survey 1970. Zeitschrift des Kölner Zoo, **16**(2): 59–74.

KYES, R. C. 1993. Survey of the long-tailed macaques introduced onto Tinjil Island, Indonesia. American Journal of Primatology, **31:** 77–83.

KYES, R. C., D. SAJUTHI, AND A. LELANA. 1991. Preliminary survey of the cynomolgus macaques on Tinjil Island. American Journal of Primatology, **24:** 114. (Abstract only.)

LABANG, D., AND LORD MEDWAY. 1979. Preliminary assessments of the diversity and density of wild mammals, man and birds in alluvial forest in the Gunong Mulu National Park, Sarawak, pp. 53–66. *In* Marshall, A. G., ed., The Abundance of Animals in Malesian Rain Forests. Department of Geography, University of Hull, and Institute of South-East Asian Biology, University of Aberdeen, [Hull].

LA CAILLE, N. L. DE. 1763. Journal Historique du Voyage Fait au Cap de Bonne-Espérance. Guillyn, Paris, xxxvj + 356 pp.

LACAZE, A. DE. 1856. Duvaucel (Alfred), columns 534–539. *In* Hoefer, M. le Dr., ed., Nouvelle Biographie Générale Depuis les Temps les Plus Reculés Jusqu'a Nos Jours . . . , vol. 15. Rosenkilde et Bagger, Copenhague. (Reprint, 1965.)

LACEPÈDE, B. G. E., AND F. M. DAUDIN. [1802]. Tableau des divisions, sous-divisions, ordres et genres des mammifères . . . avec l'indication de toutes les espèces décrites par Buffon, et leur distribution dans chacun des genres, pp. 144–195. *In* Lacepède, B. G. E., ed., Histoire Naturelle par Buffon, vol. 14. P. Didot and Firmin Didot, Paris. [For date of publication, see Husson, A. M., and L. B. Holthuis, 1953, Zoologische Mededelingen Uitgegeveven door het Rijksmuseum van Natuurlijke Historie te Leiden, **32:** 215.]

LAMBERT, F. 1990. Some notes on fig-eating by arboreal mammals in Malaysia. Primates, **31:** 453–458.

LATREILLE, P. A. 1804. Tableau méthodique des singes, pp. 275–298. *In* Sonnini, C. S., ed., Histoire Naturelle Générale et Particuliere, par Leclerc de Buffon, vol. 36. Dufart, Paris.

LAURIE, E. M. O., AND J. E. HILL. 1954. List of Land Mammals of New Guinea, Celebes and Adjacent Islands, 1758–1952. British Museum (Natural History), London, 175 pp.

LAWLER, S. H., R. W. SUSSMAN, AND L. L. TAYLOR. 1995. Mitochondrial DNA of the Mauritian macaques (*Macaca fascicularis*): An example of the founder effect. American Journal of Physical Anthropology, **96:** 133–141.

LEE CHIN THUAN. 1964. Monkey with a deformed tail. Malayan Nature Journal, **18:** 172.

LEE, D. W. 1977. Animals of Pulau Tioman, pp. 20–22. *In* Lee, D. W., B. C. Stone, M. Ratnasabapathy, and Khoo Teng Tiang, eds., The Natural History of Pulau Tioman. Merlin Samudra Tioman, [?Kuala Lumpur].

LEGENDRE, S. J. 1932. Adventures on hunting trails of Indo-China. Natural History, **32:** 481–496.

———. 1936. Land of the White Parasol and the Million Elephants: A Journey through the Jungles of Indo-China. Dodd, Mead & Company, New York, 315 pp.

LEIGHTON, M., AND D. R. LEIGHTON. 1983. Vertebrate responses to fruiting seasonality within a Bornean rain forest, pp. 181–196. *In* Sutton, S. L., T. C. Whitmore, and A. C. Chadwick, eds., Tropical Rain Forest: Ecol-

ogy and Management. Blackwell Scientific Publications, Oxford.

LEKAGUL, B., AND J. A. MCNEELY. 1977. Mammals of Thailand. Association for the Conservation of Wildlife, Bangkok, 758 pp.

LEON, S., L. TAYLOR, AND R. W. SUSSMAN. 1993. Activity patterns of captive and free-ranging long-tailed macaques (*Macaca fascicularis*). American Association of Zoological Parks and Aquariums, Regional Conference Proceedings, **1993:** 171–178.

LESCHENAULT DE LA TOUR, L. T. 1820. Extract d'une lettre de M. Leschenault a M. de Jussieu .... Mémoires du Muséum d'Histoire Naturelle, **6:** 359–364.

———. 1822. Relation abrégée d'un voyage aux Indes Orientales. Mémoires du Muséum d'Histoire Naturelle, **9:** 245–274.

LESSON, R.-P. 1827. Manuel de Mammalogie, ou Histoire Naturelle des Mammifères. Roret, Paris, xv + 442 pp.

———. [1830]. Histoire Naturelle Générale et Particulière des Mammifères et des Oiseaux Découverts depuis la Mort de Buffon. Pourrat Frères and Roret, Paris, 564 pp. [For date of publication, see I. Geoffroy, 1851, p. xji.]

LIM BOON HOCK, AND A. SASEKUMAR. 1979. A preliminary study on the feeding biology of mangrove forest primates, Kuala Selangor. Malayan Nature Journal, **33:** 105–112.

LINDSAY, H. M. 1926. Bombay Natural History Society's Mammal Survey of India, Burma and Ceylon. Report No. 39: Mergui Archipelago. Journal of the Bombay Natural History Society, **31:** 42–48.

LINNAEUS, C. 1758. Systema Naturae, vol. 1, 10th ed. Impenisis Direct. Laurentii Salvii, Holm, 824 pp.

———. 1766. Systema Naturae, vol. 1, 12th ed. Impenisis Direct. Laurentii Salvii, Holm, 532 pp.

———. 1771. Mantissa Plantarum Altera Generum Editionis VI et Specierum Editionis II. L. Salvii, Holm, 143–588 pp.

LIPPOLD, L. K. 1977. The douc langur: A time for conservation, pp. 513–538. *In* Prince Rainier III and G. H. Bourne, eds., Primate Conservation. Academic Press, New York.

LOWE, W. P. 1932. The Trail That Is Always New. Gurney and Jackson, London, 271 pp.

———. 1933. A report on the birds collected by the Vernay Expedition to Tenasserim and Siam. Ibis, 13th ser., **3:** 259–283.

LUCAS, P. W., AND R. T. CORLETT. 1991. Relationship between the diet of *Macaca fascicularis* and forest phenology. Folia Primatologica, **57:** 201–215.

———. 1992. Notes on the treatment of palm fruits by long-tailed macaques (*Macaca fascicularis*). Principes, **36:** 45–48.

LUDER, H. U. 1993. Hazard rates and causes of death in a captive group of crab-eating monkeys (*Macaca fascicularis*). American Journal of Primatology, **30:** 139–147.

LUMER, H., AND A. H. SCHULTZ. 1941. Relative growth of the limb segments and tail in macaques. Human Biology, **13:** 283–305.

LYON, M. W., JR. 1906. Mammals of Banka, Mendanau, and Billiton Islands, between Sumatra and Borneo. Proceedings of the United States National Museum, **31:** 575–612.

———. 1907. Mammals collected in western Borneo by Dr. W. L. Abbott. Proceedings of the United States National Museum, **33:** 547–572.

———. 1908. Mammals collected in eastern Sumatra by Dr. W. L. Abbott during 1903, 1906, and 1907, with descriptions of new species and subspecies. Proceedings of the United States National Museum, **34:** 619–679.

———. 1909. Additional notes on mammals of the Rhio-Linga Archipelago, with descriptions of new species and a revised list. Proceedings of the United States National Museum, **36:** 479–491.

———. 1911. Mammals collected by Dr. W. L. Abbott on Borneo and some of the small adjacent islands. Proceedings of the United States National Museum, **40:** 53–146.

———. 1916. Mammals collected by Dr. W. L. Abbott on the chain of islands lying off the western coast of Sumatra, with descriptions of twenty-eight new species and subspecies. Proceedings of the United States National Museum, **52:** 437–462.

LYON, M. W., JR., AND W. H. OSGOOD. 1909. Catalogue of the type-specimens of mammals in the United States National Museum, including the Biological Survey collection. Bulletin of the United States National Museum, **62:** i–x, 1–325.

MACDONALD, D. 1982. Expedition to Borneo: The Search for Proboscis Monkeys and Other Creatures. J. M. Dent & Sons, London, 180 pp.

MACDONALD, G. J. 1971. Reproductive patterns of three species of macaques. Fertility and Sterility, **22:** 373–377.

MACKINNON, J. R. 1971. The orang-utan in Sabah today: A study of a wild population in the Ulu Segama Reserve. Oryx, **11:** 141–191.

———. 1973. Orang-utans in Sumatra. Oryx, **12:** 234–242.

MACKINNON, J. R., AND K. S. MACKINNON. 1978. Comparative feeding ecology of six sympatric primates in West Malaysia, pp. 305–321. *In* Chivers, D. J., and J. Herbert, eds., Recent Advances in Primatology, vol. 1. Behaviour. Academic Press, London.

———. 1980. Niche differentiation in a primate community, pp. 167–190. *In* Chivers, D. J., ed., Malayan Forest Primates: Ten Years' Study in Tropical Rain Forest. Plenum, New York.

———. 1987. Conservation status of the primates of the Indo-Chinese Subregion. Primate Conservation, **8:** 187–195.

MACKINNON, K. S. 1986. The conservation status of nonhuman primates in Indonesia, pp. 99–126. *In* Benirschke, K., ed., Primates: The Road to Self-Sustaining Populations. Springer-Verlag, New York.

MAH, Y. L., AND F. P. G. ALDRICH-BLAKE. 1980. Ranging behaviour of *Macaca fascicularis* (Raffles) in two different habitats in peninsular Malaysia, pp. 353–365. *In* Furtado, J. I, ed., Tropical Ecology and Development. International Society of Tropical Ecology, Kuala Lumpur.

MANDAL, A. K. 1990. Crab-eating macaque *Macaca*

fascicularis (Raffles) feeding on house sparrow *Passer domesticus* (Linnaeus). Journal of the Bombay Natural History Society, **86:** 435.

MARSH, C. W., AND W. L. WILSON. 1981. Effects of natural habitat differences and disturbance on the abundance of Malaysian primates. Malaysian Applied Biology, **10:** 227–249.

MARSHALL, P. 1967. Wild Mammals of Hong Kong. Oxford University Press, Hong Kong, 64 pp.

MARTENS, E. V. 1876. Die Preussische Expedition nach Ost-Asien. Nach Amtlichen Quellen. Zoologischer Theil, vol. 1. Königlichen Geheimen Ober-Hofbuchdruckerei, Berlin, 412 pp.

MARTIN, W. C. L. 1838. A monograph of the genus *Semnopithecus*. Magazine of Natural History, n.s., **2:** 320–326, 434–441.

MASON, F. 1851. Tenasserim: Or Notes on the Fauna, Flora, Minerals, and Nations of British Burmah and Pegu .... American Mission Press, Maulmain, 712 pp.

MATSUBAYASHI, K., S. GOTOH, Y. KAWAMOTO, K. NOZAWA, AND J. SUZUKI. 1989. Biological characteristics of crab-eating monkeys on Angaur Island. Primate Research (Reichorui Kenkyu), **5:** 46–57.

MATSUBAYASHI, K., S. GOTOH, Y. KAWAMOTO, T. WATANABE, K. NOZAWA, M. TAKASAKA, T. NARITA, O. GRIFFITHS, AND M.-A. STANLEY. 1992. Clinical examinations on crab-eating macaques in Mauritius. Primates, **33:** 281–288.

MATSUBAYASHI, K., S. GOTOH, K. NOZAWA, AND J. SUZUKI. 1987. Reports on the crab-eating monkey in Angaur. I. Circumstances and morphology. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **6:** 81–89.

MATSUBAYASHI, K., AND D. SAJUTHI. 1981. Microbiological and clinical examinations of cynomolgus monkeys in Indonesia. Kyoto University Overseas Research Report of Studies on Indonesian Macaque, **1:** 47–56.

MATTHEWS, J. 1961. A check-list of "Hoabinhian" sites excavated in Malaya 1860–1939. Papers on Southeast Asian Subjects, **3:** 1–59.

MAYR, E. 1963. Animal Species and Evolution. Belknap Press of Harvard University Press, Cambridge, Massachusetts, 797 pp.

MCNEELY, J. A. 1977. Mammals of the Thai mangroves. Tigerpaper, **4**(1): 10–15.

MEARNS, E. A. 1905. Descriptions of new genera and species of mammals from the Philippine Islands. Proceedings of the United States National Museum, **28:** 425–460.

MEDWAY, LORD. 1958. Food bone in Niah Cave excavations, (—1958). A preliminary report. Sarawak Museum Journal, **8:** 627–636.

———. 1966. Observations on the fauna of Pulau Tioman and Pulau Tulai. 2. The mammals. Bulletin of the National Museum, Singapore, **34:** 15–32.

———. 1972a. The Gunong Benom Expedition 1967. I. Introduction. Bulletin of the British Museum (Natural History), Zoology, **23:** 1–7.

———. 1972b. The Gunong Benom Expedition 1967. 6. The distribution and altitudinal zonation of birds and mammals on Gunong Benom. Bulletin of the British Museum (Natural History), Zoology, **23:** 105–154.

———. 1972c. The Quaternary mammals of Malesia: A review, pp. 63–98. *In* Ashton, P., and M. Ashton, eds., The Quaternary Era in Malesia. Department of Geography, University of Hull, and Institute of South-East Asian Biology, University of Aberdeen, [Hull].

———. 1977. Mammals of Borneo. Monographs of the Malaysian Branch of the Royal Asiatic Society, 7: 1–172.

MEDWAY, LORD, AND D. R. WELLS. 1971. Diversity and density of birds and mammals at Kuala Lompat, Pahang. Malayan Nature Journal, **24:** 238–247.

MEGANTARA, E. N. 1989. Ecology, behavior and sociality of *Presbytis femoralis* in eastcentral Sumatra. Comparative Primatology Monographs, **2:** 171–301.

MEISHVILI, N. V., AND V. G. CHALYAN. 1986. Reproductive parameters and sexual behaviour of Java macaques (*M. fa[sc]icularis*). Vestnik Akademii Meditsinskikh Nauk SSSR, **3:** 14–16. (In Russian, with English abstract.)

MELNICK, D. J., AND G. A. HOELZER. 1993. What is mtDNA good for in the study of primate evolution? Evolutionary Anthropology, **2:** 2–10.

MERTENS, R. 1930. Die Amphibien und Reptilien der Inseln Bali, Lombok, Sumbawa und Flores. Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft, **4:** 115–344.

———. 1936. Die Säugetiere der Inseln Bali, Lombok, Sumbawa und Flores. Zoologische Jahrbüch, Abteilung für Systematik, Ökologie und Geographie der Tiere, **68:** 273–324.

MICHAEL, R. P., AND D. ZUMPE. 1988. A review of sexual initiating behavior by male and female cynomolgus monkeys and some species comparisons. Primates, **29:** 375–393.

MILLER, G. S., JR. 1900. Mammals collected by Dr. W. L. Abbott on islands in the [South] China Sea. Proceedings of the Washington Academy of Sciences, **2:** 203–246.

———. 1901. Mammals collected by Dr. W. L. Abbott on the Natuna Islands. Proceedings of the Washington Academy of Sciences, **2:** 111–138.

———. 1902a. Mammals collected by Dr. W. L. Abbott in the region of the Indragiri River, Sumatra. Proceedings of the Academy of Natural Sciences of Philadelphia, **1902:** 143–159.

———. 1902b. Mammals of the Andaman and Nicobar islands. Proceedings of the United States National Museum, **24:** 751–795.

———. 1903a. Mammals collected by Dr. W. L. Abbott on the coast and islands of Northwest Sumatra. Proceedings of the United States National Museum, **26:** 437–484.

———. 1903b. Seventy new Malayan mammals. Smithsonian Miscellaneous Collections, **45**(I–II): 1–73.

———. 1906a. The monkeys of the *Macaca nemestrina* group. Proceedings of the United States National Museum, **29:** 555–563.

———. 1906b. Mammals collected by Dr. W. L. Abbott in the Karimata Islands, Dutch East Indies. Pro-

ceedings of the United States National Museum, **31**: 55–66.

———. 1906c. The mammals collected by Dr. W. L. Abbott in the Rhio-Linga Archipelago. Proceedings of the United States National Museum, **31**: 247–286.

———. 1933. The groups and names of macaques, pp. 1–9. *In* Hartman, C. G., and W. L. Straus, Jr., eds., The Anatomy of the Rhesus Monkey (*Macaca mulatta*). Williams & Wilkins, Baltimore, Maryland.

———. 1942. Zoological results of the George Vanderbilt Sumatran Expedition, 1936–1939. Part V.—Mammals collected by Frederick A. Ulmer on Sumatra and Nias. Proceedings of the Academy of Natural Sciences of Philadelphia, **94**: 107–165.

MITTERMEIER, R. A. 1980. Conservation in Brunei. Brunei Museum Journal, **4**: 251–261.

MJÖBERG, E. 1929. Durch die Insel der Kopfjäger: Abenteuer im Innern von Borneo. F. A. Brockhaus, Leipzig, 331 pp.

———. 1930. Forest Life and Adventures in the Malay Archipelago. George Allen & Unwin, London, 201 pp.

MODIGLIANI, E. 1889. Intorno ai mammiferi dell'isola Nias. Annali del Museo Civico di Storia Naturale di Genova, 2nd ser., **7**: 238–245.

MOORE, J. C., AND G. H. H. TATE. 1965. A study of the diurnal squirrels, Sciurinae, of the Indian and Indochinese Subregions. Fieldiana: Zoology, **48**: 1–351.

MORICE, A. 1875. Coup d'Oeil sur la Faune de la Cochinchine Française. H. Georg, Lyon, 101 pp.

———. 1876. Voyage en Cochinchine pendant les Années 1872–73–74. H. Georg, Lyon, 44 pp.

MORIMOTO, M. 1982. A study of the cranial length of Catarrhina (*Macaca fascicularis, Cercopithecus aethiops*) by factor analysis. Journal of the Anthropological Society of Nippon, **90**: 97–107. (In Japanese, with English summary.)

MORRIS, R. C. 1936. To Malaya for a rhinoceros. Journal of the Bombay Natural History Society, **38**: 438–446.

MOSZKOWSKI, M. 1909. Auf neuen Wegen durch Sumatra. Dietrich Reimer (Ernst Vohsen), Berlin, xvii + 328 pp.

MOUHOT, H. 1864. Travels in the Central Parts of Indo-China (Siam), Cambodia, and Laos, during the Years 1858, 1859, and 1860. John Murray, London, 303 pp. (vol. 1), 301 pp. (vol. 2).

MÜLLER, S. [1840]. Over de Zoogdieren van den Indischen Archipel, pp. 1–57. *In* Temminck, C. J., ed., Verhandelingen over de Natuurlijke Geschiedenis der Nederlandsche Overzeesche Bezittingen . . . . Zoologie, Last van den Koning, Leiden. [For date of publication, see Husson, A. M., and L. B. Holthuis, 1955, Zoologische Mededelingen Uitgegeven door het Rijksmuseum van Natuurlijke Historie te Leiden, **34**: 22.]

MUSSER, G. G. 1981. The giant rat of Flores and its relatives east of Borneo and Bali. Bulletin of the American Museum of Natural History, **169**: 70–175.

MUSSER, G. G., AND D. CALIFIA. 1982. Results of the Archbold Expeditions. No. 106. Identities of rats from Pulau Maratua and other islands off East Borneo. American Museum Novitates, **2726**: 1–30.

MUSSER, G. G, AND M. D. CARLETON. 1993. Family Muridae, pp. 501–755. *In* Wilson, D. E., and D. M. Reeder, eds., Mammal Species of the World: A Taxonomic and Geographic Reference, 2nd ed. Smithsonian Institution Press, Washington, D.C.

NADCHATRAM, M. 1971. Templer Park: A brief account of the natural history of Taman Rimba Templer (Templer Park). Malayan Nature Journal, **24**: 139–147.

NAKAJIMA, H., T. TANAKA, H. NIGI, AND W. PRYCHODKO. 1970. Human-type ABO, MN, and Lewis blood groups, and Gm and Inv factors in several species of macaques. Primates, **11**: 243–253.

NAKHASATHIEN, S. 1989. Chiew Larn Dam wildlife rescue operation. Oryx, **23**: 146–154.

NANDA, R., R. M. BAUME, K. TANNE, AND J. SUGAWARA. 1987. Longitudinal study of craniofacial growth in *Macaca fascicularis*. American Journal of Physical Anthropology, **73**: 215–225.

NAPIER, J. R., AND P. H. NAPIER. 1967. A Handbook of Living Primates: Morphology, Ecology and Behaviour of Nonhuman Primates. Academic Press, London, 456 pp.

NAPIER, P. H. 1981. Catalogue of Primates in the British Museum (Natural History) and Elsewhere in the British Isles. Part II: Family Cercopithecidae, Subfamily Cercopithecinae. British Museum (Natural History), London, 203 pp.

———. 1985. Catalogue of Primates in the British Museum (Natural History) and Elsewhere in the British Isles. Part III: Family Cercopithecidae, Subfamily Colobinae. British Museum (Natural History), London, 111 pp.

NAPIER, P. H., AND C. P. GROVES. 1983. *Simia fascicularis* Raffles, 1821 (Mammalia, Primates): Request for suppression under the plenary powers of *Simia aygula* Linnaeus, 1758, a senior synonym. Bulletin of Zoological Nomenclature, **40**: 117–118.

NAWAR, M. M., AND E. S. E. HAFEZ. 1972. The reproductive cycle of the crab-eating macaque (*Macaca fascicularis*). Primates, **13**: 43–56.

NIEUWENHUISEN, J. T., AND H. C. B. VON ROSENBERG. 1863. Verslag omtrent het eiland Nias en deszelfs bewoners. Verhandelingen van het Bataviaasch Genootschap van Kunsten en Wetenschappen, **30**: 1–153.

NOORDWIJK, M. A. VAN. 1985. Sexual behaviour of Sumatran long-tailed macaques (*Macaca fascicularis*). Zeitschrift für Tierpsychologie, **70**: 277–296.

NOORDWIJK, M. A. VAN, AND C. P. VAN SCHAIK. 1985. Male migration and rank acquisition in wild long-tailed macaques (*Macaca fascicularis*). Animal Behaviour, **33**: 849–861.

———. 1987. Competition among female long-tailed macaques, *Macaca fascicularis*. Animal Behaviour, **35**: 577–589.

———. 1988. Male careers in Sumatran long-tailed macaques (*Macaca fascicularis*). Behaviour, **107**: 24–43.

NORDIN, M. 1981. Voluntary food intake and digestion in Malaysian primates with special reference to the intake of energy and protein. Malaysian Applied Biology, **10**: 163–175.

NORIKOSHI, K. 1984. Sociological study of the crab-

eating monkeys (*Macaca fascicularis*) on Gunung Meru in Indonesia. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **3:** 1–15.

Oberholser, H. C. 1917. The birds of the Anamba Islands. Bulletin of the United States National Museum, **98:** 1–75.

———. 1919. The birds of the Tambelan Islands, South China Sea. Proceedings of the United States National Museum, **55:** 129–143.

Oi, T. 1986. Socio-ecological study on pig-tailed macaques (*Macaca nemestrina*) in Sumatra. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **5:** 71–78.

Okamoto, M. 1994. Annual sperm concentration variation in semen collected by electroejaculation in the cynomolgus monkey (*Macaca fascicularis*). Experimental Animals, Tokyo, **43:** 25–31. (In Japanese, with English abstract.)

Omoto, K., S. Harada, T. Tanaka, H. Nigi, and W. Prychodko. 1970. Distribution of the electrophoretic variants of serum alpha$_1$-antitrypsin in six species of macaques. Primates, **11:** 215–228.

Omoto, K., M. Hirai, N. Saitou, S. Harihara, and K. Terao. 1991. Extensive polymorphism of complement C6 among crab-eating monkeys, pp. 603–604. *In* Ehara, A., T. Kimura, O. Takenaka, and M. Iwamoto, eds., Primatology Today: Proceedings of the XIIIth Congress of the International Primatological Society, Nagoya and Kyoto, 18–24 July 1990. Elsevier Science, Amsterdam.

Osbeck, P. 1757. Dagbok öfver en Ostindisk Resa . . . . Lor. Ludy. Grefing, Stockholm, 376 pp.

Osgood, W. H. 1932. Mammals of the Kelley-Roosevelts and Delacour Asiatic expeditions. Field Museum of Natural History Publication 312, Zoological Series, **18:** 193–339.

———. 1941. Hunting the rare and elusive green peacock in the Indo-China jungle. Field Museum News **12**(11): 1–2.

Ostyn, J. M., J. C. Maltha, and F. P. G. M. van der Linden. 1995. Age assessment in infant crab-eating monkeys (*Macaca fascicularis*) based on tooth development. Journal of Zoology, London, **235:** 247–252.

Pallaud, B. 1984. Conséquences d'un changement de hiérarchie et de territoire dans un groupe de macaques crabiers (*Macaca fascicularis*). Biology of Behaviour, **9:** 89–99.

Parr, J. W. K., N. Mahannop, and V. Charoensiri. 1993. Khao Sam Roi Yot—One of the world's most threatened parks. Oryx, **27:** 245–249.

Pendlebury, H. M. 1936. An expedition to Korinchi Peak, Sumatra, carried out in 1914 by Messrs H. C. Robinson and C. Boden Kloss. Journal of the Federated Malay States Museums, **8:** 1–31.

Petiver, J. 1705. De Quadrupedibus Philippensibus tractat. a Reverendo Georg. Jos. Camel. Philosophical Transactions, Royal Society, London, **25:** 2197–2204.

Pfeffer, P. 1959. Observations sur le varan de Komodo, *Varanus komodoensis* Ouwens 1912. La Terre et la Vie, **106:** 195–243.

Pirazzoli, P. A., U. Radtke. W. S. Hantoro, C. Jouannic, C. T. Hoang, C. Causse, and M. Borel Best. 1991. Quaternary raised coral-reef terraces on Sumba Island, Indonesia. Science, **252:** 1834–1836.

Plessen, V. von. 1936. Bei den Kopfjägern von Borneo. Schützen-Verlag, Berlin, 158 pp.

Pocock, R. I. 1906. Notes upon menstruation, gestation, and parturition of some monkeys that have lived in the Society's Gardens. Proceedings of the Zoological Society of London, **1906:** 558–570.

———. 1939. The Fauna of British India, including Ceylon and Burma. Mammalia.—Vol. I. Primates and Carnivora (in part), Families Felidae and Viverridae. Taylor and Francis, London, xxxiii + 463 pp.

Poirer, F. E., and E. O. Smith. 1974. The crab-eating macaques (*Macaca fascicularis*) of Angaur Island, Palau, Micronesia. Folia Primatologica, **22:** 258–306.

Poole, A. J., and V. S. Schantz. 1942. Catalog of the type specimens of mammals in the United States National Museum, including the Biological Surveys collection. Bulletin of the United States National Museum, **178:** i–xiii, 1–705.

Price, D. L. 1959. *Dirofilaria magnilarvatum* n. sp. (Nematoda: Filarioidea) from *Macaca irus* Cuvier. I. Description of the adult filarial worms. Journal of Parasitology, **45:** 499–504.

Rabor, D. S. 1986. Guide to Philippine Flora and Fauna: Birds, Mammals. Natural Resources Management Center, Ministry of Natural Resources, and University of the Philippines, Quezon City, Philippines, 211 pp.

Raffles, S. 1830. Memoir of the Life and Public Services of Sir Thomas Stamford Raffles . . . . John Murray, London, 723 pp.

Raffles, T. S. [1821]. Descriptive catalogue of a a zoological collection, made on account of the Honourable East India Company, in the island of Sumatra and its vicinity . . . . Transactions of the Linnean Society of London, **13:** 239–340. [For date of publication, see Horsfield, T., 1821, '*Tapirus Malayanus,*' p. 2, *in* Zoological Researches in Java, and the Neighbouring Islands; Kingsbury, Parbury and Allen, London; cf. Jones, G. S., and D. B. Jones, 1976, A Bibliography of the Land Mammals of Southeast Asia, 1699–1969, Bernice P. Bishop Museum, Honolulu, p. 127.]

Rain, A. N., J. W. Mak, and R. Zamri. 1993. Simian malaria infection in wild caught *Macaca fascicularis* and *Presbytis* spp[.] in Malaysia. Southeast Asian Journal of Tropical Medicine and Public Health, **24:** 386–387.

Rampino, M. R., and S. Self. 1993. Climate-volcanism feedback and the Toba eruption of ~74,000 years ago. Quaternary Research, **40:** 269–280.

Raven, H. C. 1935. Wallace's Line and the distribution of Indo-Australian mammals. Bulletin of the American Museum of Natural History, **68:** 179–283.

Ravosa, M. J. 1991. The ontogeny of cranial sexual dimorphism in two Old World monkeys: *Macaca fascicularis* (Cercopithecinae) and *Nasalis larvatus* (Colobinae). International Journal of Primatology, **12:** 403–426.

Reichenbach, L. 1862. Die Vollständigste Naturgeschichte der Affen. Expedition der vollständigsten Naturgeschichte, Dresden, 204 pp.

RENSCH, B. 1930. Ein Biologische Reise nach den Kleinen Sunda-Iseln. Gebrüder Borntraeger, Berlin, 236 pp.

RENSCH, I. 1934. Farn und Bärlappe der Sunda-Expedition Rensch. (Unter Einbeziehung einer Aufsammlung G. Steins von Timor.) Hedwigia, **74:** 224–256.

RICHTSMEIER, J. T., J. M. CHEVERUD, S. E. DANAHEY, B. D. CORNER, AND S. LELE. 1993a. Sexual dimorphism of ontogeny in the crab-eating macaque (*Macaca fascicularis*). Journal of Human Evolution, **25:** 1–30.

RICHTSMEIER, J. T., B. D. CORNER, H. M. GRAUSZ, J. M. CHEVERUD, AND S. E. DANAHEY. 1993b. The role of postnatal growth pattern in the production of facial morphology. Systematic Biology, **42:** 307–330.

RIDLEY, H. N. 1895. The mammals of the Malay Peninsula. Natural Science, **6:** 23–29.

———. 1901. Habits of the drongo. Journal of the Straits Branch of the Royal Asiatic Society, **35:** 105.

———. 1906. The Menagerie at the Botanic Gardens. Journal of the Straits Branch of the Royal Asiatic Society, **46:** 133–194.

RIJKSEN, H. D. 1978. A fieldstudy on Sumatran orang utans (*Pongo pygmaeus abeli* Lesson 1827): Ecology, behaviour and conservation. Mededelingen Landbouwhogeschool Wageningen, Nederland, **78**(2): 1–420.

RILEY, J. H. 1930. Birds from the small islands off the northeast coast of Dutch Borneo. Proceedings of the United States National Museum, **77**(12): 1–23.

———. 1938. Birds from Siam and the Malay Peninsula in the United States National Museum collected by Drs. Hugh M. Smith and William L. Abbott. Bulletin of the United States National Museum, **172:** 1–581.

ROBINSON, A. H., AND Y. RUSTANDI. 1982. Bali Barat National Park. Parks, **7**(2): 13–14.

ROBINSON, H. C. 1915. The zoology of Koh Samui and Koh Pennan. I. Introduction. Journal of the Federated Malay States Museums, **5:** 128–129.

———. 1916. A collection of mammals and birds from Pulau Panjang or Pulau Mapor, Rhio-Lingga Archipelago. Journal of the Federated Malay States Museums, **7:** 59–72.

———. 1917. On a collection of birds from Pulau Langkawi and other islands on the north-west coast of the Malay Peninsula. Journal of the Federated Malay States Museums, **7:** 129–191.

———. 1919. Notes on the vertebrate fauna of the Pahang-Johore Archipelago. Journal of the Federated Malay States Museums, **7:** 325–329.

———. 1921. The birds of South-West and Peninsular Siam . . . Introduction. Journal of the Natural History Society of Siam, **5:** 1–15.

ROBINSON, H. C., AND C. B. KLOSS. 1910. On birds from the northern portion of the Malay Peninsula, including the islands of Langkawi and Terutau; with notes on other rare Malayan species from the southern districts. Ibis, 9th ser., **4:** 659–675.

———. 1914. Some remarks on Dr. D. G. Elliot's 'Review of the Primates.' Annals and Magazine of Natural History, 8th ser., **13:** 389–399.

———. 1915a. The zoology of Koh Samui and Koh Pennan. II. Mammals. Journal of the Federated Malay States Museums, **5:** 130–139.

———. 1915b. List of a small collection of mammals and birds from the Krau River, western Pahang. Journal of the Federated Malay States Museums, **5:** 169–175.

———. 1918. Mammals of Korinchi. Journal of the Federated Malay States Museums, **8:** 1–72.

———. 1919. On a collection of birds from the province of Puket, peninsular Siam. Journal of the Natural History Society of Siam, **3:** 87–119.

RODE, P. 1938. Catalogue des types de mammifères du Muséum National d'Histoire Naturelle. I. Ordre des Primates. A.—Sous-ordre des simiens. Bulletin du Muséum National d'Histoire Naturelle, Paris, 2nd ser., **10:** 202–251.

RODMAN, P. S. 1973. Synecology of Bornean primates. I. A test for interspecific interactions in spatial distribution of five species. American Journal of Physical Anthropology, **38:** 655–659.

———. 1978. Diets, densities, and distributions of Bornean primates, pp. 465–478. *In* Montgomery, G., ed., The Ecology of Arboreal Folivores. Smithsonian Institution Press, Washington, D.C.

———. 1991. Structural differentiation of microhabitats of sympatric *Macaca fascicularis* and *M. nemestrina* in East Kalimantan, Indonesia. International Journal of Primatology, **12:** 357–375.

ROEDELBERGER, F. A., AND V. I. GROSCHOFF. 1967. Wildlife of the South Seas. Constable, London, 216 pp.

ROSENBERG, H. VON. 1882. Die Affen von Insulinde. Zoologische Garten, **23:** 111–115.

ROTHCHILD, G. 1971. Animals in Bako National Park. Malayan Nature Journal, **24:** 163–169.

ROTHCHILD, W. 1894. First glimpses of the zoology of the Natuna Islands. I. Introduction. Novitates Zoologicae, **1:** 467–468.

RUBIO, R. P., P. L. ALVIOLA III, AND M. R. FELIZARDO. 1990. CITES Study A: Biological and Economic Implications in the Trade and Commercial Exploitation of the Philippine Long-Tailed Macaques. World Wildlife Fund (USA), Haribon Foundation for the Conservation of Natural Resources, and Department of Environment and Natural Resources, [?Manila], 135 pp.

RUHIYAT, Y. 1986. Preliminary study of proboscis monkey (*Nasalis larvatus*) in Gulung Palung Nature Reserve, West Kalimantan. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **5:** 59–69.

RUITER, J. R. DE. 1993. Capturing wild long-tailed macaques (*Macaca fascicularis*). Folia Primatologica, **59:** 89–104.

RUITER, J. R. DE, AND J. A. R. A. M VAN HOOFF. 1993. Male dominance rank and reproductive success in primate groups. Primates, **34:** 513–523.

RUITER, J. R. DE, J. A. R. A. M VAN HOOFF, AND W. SCHEFFRAHN. 1994. Social and genetic aspects of paternity in wild long-tailed macaques (*Macaca fascicularis*). Behaviour, **129:** 203–224.

RUITER, J. R. DE, W. SCHEFFRAHN, G. J. J. M. TROMMELEN, A. G. UITTERLINDEN, R. D. MARTIN, AND J. A. R. A. M VAN HOOFF. 1992. Male social rank and reproductive success in wild long-tailed macaques, pp. 175–191. *In* Martin, R. D., A. F. Dixson, and E. J. Wickings, eds., Paternity in Primates: Genetic Tests and Theories. Implications of Human DNA Fingerprinting. Karger, Basel.

SALTER, R. E., AND K. M. AKEN. 1983. The proboscis monkey in Bako National Park, Sarawak. Tigerpaper, **10**(3): 6–8.

SAMILCHUK, E., AND S. SARSANIYA. 1994. Genetic polymorphism of alpha-1-antitrypsin in macaque species. Primates, **35:** 353–360.

SARKER, S. U., AND N. J. SARKER. 1984. Mammals of Bangladesh—Their status, distribution and habitat. Tigerpaper, **11**(1): 8–13.

SATMOKO, R. K. P. 1961. Udjung-Kulon Nature Park, Java, pp. 107–124. *In* Wyatt-Smith, J., and P. R. Wycherley, eds., Nature Conservation in Western Malaysia, 1961. Malayan Nature Society, Kuala Lumpur.

SCHAIK, C. P. VAN, AND T. MITRASETIA. 1990. Changes in the behaviour of wild long-tailed macaques (*Macaca fascicularis*) after encounters with a model python. Folia Primatologica, **55:** 104–108.

SCHAIK, C. P. VAN, W. J. NETTO, A. J. J. VAN AMERONGEN, AND H. WESTLAND. 1989. Social rank and sex ratio of captive long-tailed macaque females (*Macaca fascicularis*). American Journal of Primatology, **19:** 147–161.

SCHAIK, C. P. VAN, AND M. A. VAN NOORDWIJK. 1985a. Evolutionary effect of the absence of felids on the social organization of macaques on the island of Simeulue (*Macaca fascicularis fusca,* Miller, 1903). Folia Primatologica, **44:** 138–147.

———. 1985b. Interannual variability in fruit abundance and the reproductive seasonality in Sumatran long-tailed macaques (*Macaca fascicularis*). Journal of Zoology, London, ser. A, **206:** 533–549.

———. 1986. The hidden costs of sociality: Intra-group variation in feeding strategies in Sumatran long-tailed macaques (*Macaca fascicularis*). Behaviour, **99:** 296–315.

———. 1988. Scramble and contest in feeding competition among female long-tailed macaques (*Macaca fascicularis*). Behaviour, **105:** 77–98.

SCHAIK, C. P. VAN, M. A. VAN NOORDWIJK, R. J. DE BOER, AND I. DEN TONKELAAR. 1983a. The effect of group size on time budgets and social behaviour in wild long-tailed macaques (*Macaca fascicularis*). Behavioral Ecology and Sociobiology, **13:** 173–181.

SCHAIK, C. P. VAN, M. A. VAN NOORDWIJK, T. VAN BRAGT, AND M. A. BLANKENSTEIN. 1991. A pilot study of the social correlates of levels of urinary cortisol, prolactin, and testosterone in wild long-tailed macaques (*Macaca fascicularis*). Primates, **32:** 345–356.

SCHAIK, C. P. VAN, M. A. VAN NOORDWIJK, B. WARSONO, AND E. SUTRIONO. 1983b. Party size and early detection of predators in Sumatran forest primates. Primates, **24:** 211–221.

SCHAUENSEE, R. M. DE, AND S. D. RIPLEY. 1940a. Zoological results of the George Vanderbilt Sumatran Expedition, 1936–1939. Part I.—Birds from Atjeh. Proceedings of the Academy of Natural Sciences of Philadelphia, **91:** 311–368.

———. 1940b. Zoological results of the George Vanderbilt Sumatran Expedition, 1936–1939. Part III.—Birds from Nias Island. Proceedings of the Academy of Natural Sciences of Philadelphia, **91:** 399–413.

SCHEFFRAHN, W., J. R. DE RUITER, AND J. A. R. A. M VAN HOOFF. 1994. Genetic relatedness within and between populations of *Macaca fascicularis* on Sumatra and off-shore islands, pp. 131–152. *In* Ruiter, J. de, ed., Behaviour and genes in natural populations of long-tailed macaques (*Macaca fascicularis*). Thesis, Faculty of Biology, Utrecht University, Utrecht.

SCHINZ, H. R. 1821. Das Thierreich . . . , vol. 1. J. G. Cotta'schen Buchhandlung, Stuttgart, xxxviii + 894 pp.

———. 1825. Das Thierreich . . . , vol. 4. J. G. Cotta'schen Buchhandlung, Stuttgart, xiii + 793 pp.

SCHLEGEL, H. 1876. Monographie 40: Simiae. Revue Méthodique, Muséum d'Histoire Naturelle des Pays-Bas, **7:** 1–356.

SCHMITT, J., D. GRAUR, AND J. TOMIUK. 1990. Phylogenetic relationships and rates of evolution in primates: Allozymic data from catarrhine and platyrrhine species. Primates, **31:** 95–108.

SCHNEIDER, G. 1905. Ergebnisse zoologischer Forschungsreisen in Sumatra. Erster Teil. Säugetiere (Mammalia). Zoologische Jarbücher. Abteilung für Systematik, Geographie und Biologie der Tiere, **23:** 1–172.

SCHREBER, J. C. D. [1774]. Die Säugthiere in Abbildungen nach der Nature mit Beschreibungen. Erster Theil. Wolfgang Walther, Erlangen, 190 pp. [For date of publication, see Sherborn, C. D., 1892, Proceedings of the Zoological Society of London, **1891:** 588.]

SCHWARZ, E. 1912. Die Säugetierausbeute der Sunda-Expedition, pp. 303–304. *In* Elbert, J., ed., Die Sunda-Expedition des Vereins für Geographie und Statistik zu Frankfurt am Main, vol. 2. Hermann Minjon, Frankfurt am Main.

———. 1913. Two new mammals from the Malay Archipelago. Annals and Magazine of Natural History, 8th ser., **11:** 296–298.

———. 1914. Säugetiere von Timor, pp. 113–135. *In* Haniel, C. B., ed., Zoologie von Timor . . . II. Lieferung. Kommissionsverlag der E. Schweizerbartschen Verlagsbuchhandlung, Nägele und Dr. Sproesser, Stuttgart.

SCOPOLI, I. A. 1786. Deliciae Florae et Faunae Insubricae Seu Novae, aut Minus Cognitae Species quas in Insubria Austriaca Tam Spontaneas, quam Exoticas Vidit, Descripsit, et Aeri Incidi Curavit. Monasterii S. Salvatoris, Ticino, 87 pp.

SCOTT, G. G. 1982. South-East Asian macaques: A study of skin and skull variation. M.A. Thesis, Australian National University, Canberra, 234 pp.

SEIDENSTICKER, J. 1983. Predation by *Panthera* cats and measures of human influence in habitats of South Asian monkeys. International Journal of Primatology, **4:** 323–326.

SHEBBEARE, E. O. 1940. Malayan mammals. Malayan Nature Journal, **1:** 54–59.

SHELFORD, R. W. C. 1916. A Naturalist in Borneo. T. Fisher Unwin, London, 331 pp.

SHIMIZU, T., H. NARITA, F. OHKUBO, T. YOSHIDA, F. CHO, AND Y. YOSHIKAWA. 1994. A feeding experiment on laboratory-bred male cynomolgus monkeys. I. Morphometric study. Experimental Animals, Tokyo, **43:** 173–180. (In Japanese, with English summary.)

SHIVELY, C., S. CLARKE, N. KING, S. SCHAPIRO, AND G. MITCHELL. 1982. Patterns of sexual behavior in male macaques. American Journal of Primatology, **2:** 373–384.

SHIVELY, C., AND D. G. SMITH. 1985. Social status and reproductive success of male *Macaca fascicularis.* American Journal of Primatology, **9:** 129–135.

SINHA, S., AND A. GAJANANA. 1984. First report of natural infection with quartan malaria parasite *Plasmodium shortti* in *Macaca fascicularis umbrosa* (=*irus*) of Nicobar Islands. Transactions of the Royal Society of Tropical Medicine and Hygiene, **78:** 567.

SLACK, J. H. 1867. Mammalogical notices. Proceedings of the Academy of Natural Sciences of Philadelphia, **19:** 34–38.

SMALL, M. F. 1994. Macaque see, macaque do. Natural History, **103**(3): 8–11.

SMITH, B. H., T. L. CRUMMETT, AND K. L. BRANDT. 1994. Ages of eruption of primate teeth: A compendium for aging individuals and comparing life histories. Yearbook of Physical Anthropology, **37:** 177–231.

SMITH, D. G., AND R. E. FERRELL. 1980. A family study of hemoglobin polymorphism in *Macaca fascicularis.* Journal of Human Evolution, **9:** 557–563.

SMITH, E. G. W. 1974. Handbook of Marine Science, vol. 1. CRC Press, Cleveland, 627 pp.

SNELLEMAN, J. F. 1887. Zoogieren en vogels, pp. 1–58. *In* Veth, P. J., ed., Midden-Sumatra. Reizen en Onderzoekingen der Sumatra-Expeditie, Uitgerust door het Aardrijkskundig Genootschap, 1877–1879, vol. 4, pt. 1. E. J. Brill, Leiden.

SOCHA, W. W., AND J. RUFFIÉ. 1983. Blood Groups of Primates: Theory, Practice, Evolutionary Meaning. Alan R. Liss, New York, 266 pp.

SODY, H. J. V. 1929. Naamlijst van de zoogdieren van Java (met korte beschrijvingen van twee niuwe subspecies). Natuurkundig Tijdschrift voor Nederlandsch-Indie, **89:** 160–166.

———. 1932. Four new mammals from Bali and Soemba. Natuurkundig Tijdschrift voor Nederlandsch-Indië, **92:** 334–340.

———. 1933. On the mammals of Bali (with a note on the races of *Callosciurus notatus* of Java). Natuurkundig Tijdschrift voor Nederlandsch-Indië, **93:** 56–95.

———. 1937. On the mammals of Banka. Temminckia, **2:** 221–250.

———. 1949. Notes on some primates, carnivora, and the babirusa from the Indo-Malayan and Indo-Australian Regions (with descriptions of 10 new species and subspecies). Treubia, **20:** 121–190.

SONDAAR, P. Y., G. D. VAN DEN BERGH, B. MUBROTO, F. AZIZ, J. DE VOS, AND U. L. BATU. 1994. Middle Pleistocene faunal turnover and colonization of Flores (Indonesia) by *Homo erectus.* Comptes Rendus de l'Académie des Sciences, Sciences de la Terre et des Planètes, ser. II, **319:** 1255–1262.

SOUTHWICK, C. H., AND F. C. CADIGAN, JR. 1972. Population studies of Malaysian primates. Primates, **13:** 1–18.

SOUTHWICK, C. H., AND D. MANRY. 1987. Habitat and population changes for the Kowloon macaques. Primate Conservation, **8:** 48–49.

SOUTHWICK, C. H., AND B. ROSENBAUM. 1992. The primate community of Pulau Kaget, Kalimantan. Abstracts, XIVth Congress of the International Primatological Society, p. 88. (Abstract only.)

SOUTHWICK, C. H., AND K. L. SOUTHWICK. 1983. Polyspecific groups of macaques on the Kowloon Peninsula, New Territories, Hong Kong. American Journal of Primatology, **5:** 17–24.

SPENCER, C. 1975. Interband relations, leadership behaviour and the initiation of human-oriented behaviour in bands of semi-wild free ranging *Macaca fascicularis.* Malayan Nature Journal, **29:** 83–89.

SPIEGEL, A. 1952. Weitere Beobachtungen über den zeitlichen Ablauf der Bezahnung u. des Zhanwechels bei Javamakaken. Zeitschrift für Säugetierkunde, **18:** 123–135.

———. 1954. Beobachtungen und Untersuchungen an Javamakaken. Zoologische Garten, n.s., **20:** 227–270.

———. 1985. Postnatal growth of *Macaca fascicularis* born in captivity. Primate Report, **13:** 1–55.

STEENIS-KRUSEMAN, M. J. VAN. 1950. Malaysian plant collectors and collections, being a cyclopedia of botanical exploration in Malaysia and a guide to the concerned literature up to the year 1950. Flora Malesiana, 1st ser., **1:** lxxvi–clii, 1–639.

STEWART, T. D. 1933. The skin and its appendages, pp. 28–35. *In* Hartman, C. G., and W. L. Straus, Jr., eds., The Anatomy of the Rhesus Monkey (*Macaca mulatta*). Williams & Wilkins, Baltimore, Maryland.

STILES, C. W., AND M. O. NOLAN. 1929. Key catalogue of primates for which parasites are reported. U.S. Hygienic Laboratory Bulletin, **152:** 409–601.

STORER, P. J. 1978. A biological survey of a lowland evergreen scrub forest and meadowland in southern Thailand. Natural History Bulletin of the Siam Society, **27:** 93–114.

———. 1979. A preliminary biological survey of Khao Khieo Wildlife Sanctuary. Natural History Bulletin of the Siam Society, **28:** 25–46.

STOTT, K., JR. 1964. Lungmanis: Peace in a forest primeval. Zoonooz, San Diego, **37**(10): 10–15.

STREMME, H. 1911. Die Säugetiere mit Ausnahme der Proboscidier, pp. 82–150. *In* Selenka, M. L., and M. Blanckenhorn, eds., Die Pithecanthropus-Schichten auf Java . . . . Wilhelm Engelmann, Leipzig.

STRESEMANN, E. 1938. Vögel vom Fluss Kajan (Nordost-Borneo) gesammelt von Baron Victor von Plessen. Temminckia, **3:** 109–136.

SUGARDJITO, J., C. P. VAN SCHAIK, M. A. VAN NOORDWIJK, AND T. MITRASETIA. 1989. Population status

of the Simeulue monkey (*Macaca fascicularis fusca*). American Journal of Primatology, **17:** 197–207.

SUMARDJA, E. A. 1981. First five national parks in Indonesia. Parks, **6**(2): 1–4.

SUPRIATNA, J., B. O. MANULLANG, AND E. SOEKARA. 1986. Group composition, home range, and diet of the maroon leaf monkey (*Presbytis rubicunda*) at Tanjung Puting Reserve, central Kalimantan, Indonesia. Primates, **27:** 185–190.

SUSSMAN, R. W., AND I. TATTERSALL. 1981. Behavior and ecology of *Macaca fascicularis* in Mauritius: A preliminary study. Primates, **22:** 192–205.

———. 1986. Distribution, abundance, and putative ecological strategy of *Macaca fascicularis* on the island of Mauritius, southwestern Indian Ocean. Folia Primatologica, **46:** 28–43.

SUZUKI, A. 1986. The ecological survey on the effects of the forest fires and droughts in 1982–83, and the distributions and populations of primates along the middle-upper streams of Sungai Sengata in Kutai National Park, East Kalimantan, Indonesia. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **5:** 13–22.

———. 1989. Socio-ecological studies of orangutans and primates in Kutai National Park, East Kalimantan in 1988–89. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **7:** 1–42.

———. 1991. Forest fires' effects on the population of primates in Kutai National Park, East Kalimantan, Indonesia, pp. 51–54. *In* Ehara, A., T. Kimura, O. Takenaka, and M. Iwamoto, eds., Primatology Today: Proceedings of the XIIIth Congress of the International Primatological Society, Nagoya and Kyoto, 18–24 July 1990. Elsevier Science, Amsterdam.

SUZUKI, J., AND P. VARAVUDHI. 1989. Somatometric data of crab-eating macaques in Thailand. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **7:** 110–116.

SUZUKI, M. T., T. ONO, M. KOHNO, H. OGAWA, AND F. CHO. 1990. Hour of delivery in cynomolgus monkeys under indoor individually-caged conditions. Primates, **31:** 251–255.

SWISHER III, C. C. 1994. Response to J. de Vos and P. Sondaar, Dating hominid sites in Indonesia. Science, **266:** 1727.

SWISHER III, C. C., G. H. CURTIS, T. JACOB, A. G. GETTY, A. SUPRIJO, AND WIDIASMORO. 1994. Age of the earliest known hominids in Java. Science, **263:** 1118–1121.

TAKENAKA, A., AND O. TAKENAKA. 1991. Multiplication of α-globin genes in higher non-human primates, pp. 631–632. *In* Ehara, A., T. Kimura, O. Takenaka, and M. Iwamoto, eds., Primatology Today: Proceedings of the XIIIth Congress of the International Primatological Society, Nagoya and Kyoto, 18–24 July 1990. Elsevier Science, Amsterdam.

TAKENAKA, A., S. UEDA, K. TERAO, AND O. TAKENAKA. 1991. Multiple α-globin genes in crab-eating macaques (*Macaca fascicularis*). Molecular Biology and Evolution, **8:** 320–326.

TAKENAKA, O., A. TAKENAKA, M. ARAKAWA, T. ISHIDA, J. SUZUKI, Y. KAWAMOTO, AND P. VARAVUDHI. 1989. The multiple α-globin genes in the crab-eating macaques (*Macaca fascicularis*) and geographical distribution in Thailand. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **7:** 81–93.

TANAKA, H. 1991. Distribution of the α_1-antitrypsin (α_1-AT) variants detected with isoelectric focusing in crab-eating macaques (*Macaca fascicularis*). Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **8:** 43–50.

TANAKA, H., Y. KAWAMOTO, T. ISHIDA, J. SUZUKI, O. TAKENAKA, AND P. VARAVUDHI. 1989. Polymorphism of the vitamin D binding protein (DBP) in Thailand crab-eating macaques (*Macaca fascicularis*). Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **7:** 104–109.

TANAKA, H., Y. KAWAMOTO, AND K. TERAO. 1991. Genetic polymorphism of the vitamin D-binding protein (DBP) in crab-eating macaques (*Macaca fascicularis*). Journal of Medical Primatology, **20:** 126–132.

TANGPRAPRUTIGUL, P., AND P. VARAVUDHI. 1982. Lack of breeding seasonality in the *Macaca fasciciularis* studied in Bangkok environment. Journal of Steroid Biochemistry, **17:** xci. (Abstract only.)

TAUB, D. M., AND M. G. BOND. 1982. Differences among Malayan and Philippine *M. fascicularis* in serum lipid responses. International Journal of Primatology, **3:** 339. (Abstract only.)

TERAO, K. 1985. Genetic control of the cynomolgus monkey breeding colony by the use of blood groups. Japanese Journal of Medical Science & Biology, **38:** 49–52.

TERAO, K., K. FUJIMOTO, F. CHO, AND S. HONJO. 1981. Inheritance and distribution of human-type A-B-O blood groups in cynomolgus monkeys. Journal of Medical Primatology, **10:** 72–80.

THEUNISSEN, B., J. DE VOS, P. Y. SONDAR, AND F. AZIZ. 1990. The establishment of a chronological framework for the hominid-bearing deposits of Java; a historical survey. Geological Society of America, Special Paper, **242:** 39–54.

THOMAS, O. 1886. On the mammals presented by Allan O. Hume, Esq., C. B., to the Natural History Museum. Proceedings of the Zoological Society of London, **1886:** 54–79.

———. 1906. Mammals, pp. 3–66. *In* The History of the Collections Contained in the Natural History Departments of the British Museum, vol. 2. British Museum, London.

———. 1923. On some mammals from Simalur Island, west of Sumatra, collected by Mr. E. Jacobson. Annals and Magazine of Natural History, 9th ser., **12:** 591–593.

———. 1928. The Delacour Exploration of French Indo-China.—Mammals. III. Mammals collected during the Winter of 1927–28. Proceedings of the Zoological Society of London, **1928:** 831–841.

THOMAS, O., AND E. HARTERT. 1894. First glimpses of the zoology of the Natuna Islands. III. List of the first collection of mammals from the Natuna Islands. Novitates Zoologicae, **1:** 652–660.

THOMAS, O., AND R. C. WROUGHTON. 1909a. On a collection of mammals from western Java presented

to the National Museum by Mr. W. E. Balston. Proceedings of the Zoological Society of London, **1909:** 371–392.

———. 1909b. On mammals from the Rhio Archipelago and Malay Peninsula collected by Messrs. H. C. Robinson, C. Boden Kloss and E. Seimund, and presented to the National Museum by the Government of the Federated Malay States. Journal of the Federated Malay States Museum, **4:** 99–129.

———. 1909c. Two new macaques from W. Java. Annals and Magazine of Natural History, 8th ser., **3:** 380–381.

Thompson, N. S. 1967. Primate infanticide: A note and a request for information. Laboratory Primate Newsletter, **6**(3): 18–19.

Thonglongya, K. 1967. Note on the type locality of some birds and mammals collected by Count Nils Gyldenstolpe in Thailand. Natural History Bulletin of the Siam Society, **22:** 185–187.

Tickell, S. R. 1854–1875. Mammals of India. Unpublished manuscript in library of Zoological Society of London.

———. 1859. Itinerary, with memoranda, chiefly topographical and zoological, through the southerly portions of the district of Amherst, Province of Tenasserim. Journal of the Asiatic Society of Bengal, **28:** 421–456.

Timmermans, P. J. A., W. G. P. Schouten, and J. C. M. Krijnen. 1981. Reproduction of cynomolgus monkeys (*Macaca fascicularis*) in harems. Laboratory Animals, **15:** 119–123.

Tomiuk, J. 1989a. Gene duplication and polymorphism at the amylase loci of *Macaca fascicularis* and *Macaca mulatta*. Primates, **30:** 89–94.

———. 1989b. Hemoglobin polymorphism in macaques with reference to the evolution of *Macaca fascicularis* and *Macaca mulatta*. Primates, **30:** 95–102.

Trouessart, E.-L. 1904. Catalogus Mammalium Tam Viventium Quam Fossilium, suppl. 5. R. Friedländer & Sohn, Berlin, 929 pp.

Tweedie, M. W. F. 1940. Report on excavations in Kelantan. Journal of the Malayan Branch of the Royal Asiatic Society, **18**(2): 1–22.

Tweedie, M. W. F., and J. L. Harrison. 1954. Malayan Animal Life. Longmans, Green and Co., London, vii + 237 pp.

Ungar, P. S. 1994. Patterns of ingestive behavior and anterior tooth use in sympatric anthropoid primates. American Journal of Physical Anthropology, **95:** 197–219.

———. 1995. Fruit preferences of four sympatric primate species at Ketambe, northern Sumatra, Indonesia. International Journal of Primatology, **16:** 221–245.

U.S. Board on Geographic Names. 1952. India, 2 vols. Washington, D.C., 787 pp.

———. 1964. Northern Vietnam. Washington, D.C., 311 pp.

———. 1966a. Burma. Washington, D.C., 725 pp.

———. 1966b. Thailand. Washington, D.C., 675 pp.

———. 1970. Malaysia, Singapore, and Brunei, 2nd ed. Washington, D. C., 1014 pp.

———. 1971a. Cambodia, 2nd ed. Washington, D.C., 392 pp.

———. 1971b. South Vietnam. Washington, D.C., 337 pp.

———. 1973. Laos, 2nd ed. Washington, D.C., 348 pp.

———. 1976. Bangladesh. Washington, D.C., 526 pp.

———. 1982. Indonesia, 3rd ed., 2 vol. Washington, D.C., 1529 pp.

U.S. Defense Mapping Agency. 1975a. Bathymetric chart No. 71000. Washington, D.C.

———. 1975b. Bathymetric chart No. 71006. Washington, D.C.

———. 1985. Bathymetric chart No. 93036. Washington, D.C.

———. 1986. Bathymetric chart No. 94004. Washington, D.C.

———. 1990. Bathymetric chart No. 63400. Washington, D.C.

———. 1993. Bathymetric chart No. 63020. Washington, D.C.

Valerio, D. A., A. J. Pallotta, and K. D. Courtney. 1969. Experiences in large-scale breeding of simians for medical experimentation. Annals of the New York Academy of Sciences, **162:** 282–296.

Van Couvering, J. A., and G. Kukla. 1988. Pleistocene, pp. 459–464. *In* Tattersall, I., E. Delson, and J. A. Van Couvering, eds., Encyclopedia of Human Evolution and Prehistory. Garland, New York.

Van Peenen, P. F. D., M. L. Cunningham, and J. F. Duncan. 1970. A collection of mammals from Con Son Island, Vietnam. Journal of Mammalogy, **51:** 419–424.

Van Peenen, P. F. D., H. Hoogstraal, J. F. Duncan, and P. F. Ryan. 1968. Hematozoa from mammals of South Vietnam. Journal of Protozoology, **15:** 608–614.

Van Peenen, P. F. D., S. W. Joseph, Ansari Saleh, R. H. Light, S. Sukeri, and R. See. 1974. The Indonesian Developmental Area Study: Observations on mammals from South and East Kalimantan (Borneo). Southeast Asian Journal of Tropical Medicine and Public Health, **5:** 390–397.

Van Peenen, P. F. D., R. H. Light, and J. F. Duncan. 1971. Observations on mammals of Mt. Sontra, South Vietnam. Mammalia, **35:** 126–143.

Van Peenen, P. F. D., P. F. Ryan, and R. H. Light. 1969. Preliminary Identification Manual for Mammals of South Vietnam. United States National Museum, Smithsonian Institution, Washington, D.C., vi + 310 pp.

Varavudhi, P., C. Ekavipasti, U. Yodyingyuad, T. Nootprapand, V. Yodyingyuad, Y. Chaiseha, W. Set[t]heetham, and K. Suwanprasert. 1989a. Growth and reproductive potential of free-ranging cynomolgus monkey (*Macaca fascicularis*) in 9 selected regions of Thailand. Journal of the Science Society of Thailand, **15:** 221–227.

Varavudhi, P., K. Suwanprasert, and W. Setthee-

THAM. 1992. Reproductive endocrinology of free-ranging adult cynomolgus monkeys (*Macaca fascicularis*) in Thailand, pp. 337–345. *In* Matano, S., R. H. Tuttle, H. Ishida, and M. Goodman, eds., Topics in Primatology, vol. 3. Evolutionary Biology, Reproductive Endocrinology, and Virology. University of Tokyo Press, Tokyo.

VARAVUDHI, P., J. SUZUKI, U. YODYINGYUAD, T. NOOTPRAPAND, V. YODYINGYUAD, Y. CHAISEHA, K. SUWANPRASERT, AND W. SETTHEETHAM. 1989b. Mother–infant relationship on patterns of thyroxine and tri-iodothyronine production obtained from 4 major regions in Thailand. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **7:** 76–80.

VIGORS, N. A. 1830. Catalogue of zoological specimens, pp. 633–697. *In* Raffles, S., Memoir of the Life and Public Services of Sir Thomas Stamford Raffles . . . . John Murray, London. [For name of author of catalogue, see p. 629.]

VITALE, A. F., E. VISALBERGHI, AND C. DE LILLO. 1991. Responses to a snake model in captive crab-eating macaques (*Macaca fascicularis*) and captive tufted capuchins (*Cebus apella*). International Journal of Primatology, **12:** 277–286.

VOLZ, W. 1912. Nord-Sumatra . . . , vol. 2. Dietrich Reimer (Ernst Vohsen), Berlin, 428 pp.

VORDERMAN, A. G. 1900. Inlandsche namen van eenige Madoereesche planten en simplicia. Natuurkundig Tijdschrift voor Nederlandsch-Indië, **59:** 140–143.

VOS, D. R., G. J. KARSSEMEIJER, AND J. A. R. A. M VAN HOOFF. 1992. Ecological constraints on the behaviour of mother long-tailed macaques (*Macaca fascicularis*). Behavioral Ecology and Sociobiology, **31:** 385–391.

VOS, J. DE. 1983. The *Pongo* faunas from Java and Sumatra and their significance for biostratigraphical and paleo-ecological interpretations. Proceedings of the Koninklijke Nederlandse Akademie van Wetenschappen, ser. B, **86**(4): 417–425.

VOS, J. DE, AND P. SONDAAR. 1994. Dating hominid sites in Indonesia. Science, **266:** 1726–1727.

VOS, J. DE, P. Y. SONDAAR, G. D. VAN DEN BERGH, AND F. AZIZ. 1994. The *Homo* bearing deposits of Java and its ecological context. Courier Forschungs-Institut Senckenberg, **171:** 129–140.

WAGNER, J. A. [1839]. Die Säugthiere in Abbildungen nach der Natur mit Beschreibungen, suppl. vol. 1. Expedition des Schreber'schen Säugthier- und des Esper'schen Schmetterlingswerkes, und in Commission der Palm'schen Verlagsbuchhandlung, Erlangen, 551 pp. [For date of publication, see Sherborn, C. D., 1892, Proceedings of the Zoological Society of London, **1891:** 591.]

WALLACE, A. R. 1869. The Malay Archipelago . . . , vol. 1. Macmillan and Co., London, 478 pp.

———. 1895. Island Life . . . . Macmillan and Co., London, 563 pp.

WALLIS, J., B. J. KING, AND C. ROTH-MEYER. 1986. The effect of female proximity and social interaction on the menstrual cycle of crab-eating monkeys (*Macaca fascicularis*). Primates, **27:** 83–94.

WARREN, MCW. 1966. Observations on the fauna of Pulau Tioman and Pulau Tulai. 12. Primate malaria. Bulletin of the National Museum, Singapore, **34:** 150–158.

WARREN, MCW., W. H. CHEONG, H. K. FREDERICKS, AND G. R. COATNEY. 1970. Cycles of jungle malaria in West Malaysia. American Journal of Tropical Medicine and Hygiene, **19:** 383–393.

WASHBURN, S. L., AND D. A. HAMBURG. 1968. Aggressive behavior in Old World monkeys and apes, pp. 458–478. *In* Jay, P. C., ed., Primates: Studies in Adaptation and Variability. Holt, Rinehart and Winston, New York.

WATERHOUSE, G. R. 1838. Catalogue of the Mammalia Preserved in the Museum of the Zoological Society of London, 2nd ed. Richard and John E. Taylor, London, 68 pp.

WEBER, B. E. 1972. A parks system for West Malysia. Oryx, **11:** 461–469.

WEBER, M. 1890a. Einleitung, pp. i–xii. *In* Weber, M., ed., Zoologische Ergebnisse Einer Reise in Niederländisch Ost-Indien, vol. 1. E. J. Brill, Leiden.

———. 1890b. Mammalia from the Malay Archipelago. I. Primates, Prosimiae, Galeopithecidae, Carnivora, Artiodactyla, Edentata, Marsupialia, pp. 93–114. *In* Weber, M., ed., Zoologische Ergebnisse Einer Reise in Niederländisch Ost-Indien, vol. 1. E. J. Brill, Leiden.

WEINMAN, D., AND N. S. WIRATMADJA. 1969. The first isolates of trypanosomes in Indonesia and in history from primates other than man. Transactions of the Royal Society of Tropical Medicine and Hygiene, **63:** 497–506.

WEITZEL, V., AND C. P. GROVES. 1985. The nomenclature and taxonomy of the colobine monkeys of Java. International Journal of Primatology, **6:** 399–409.

WEITZEL, V., C. M. YANG, AND C. P. GROVES. 1988. A catalogue of primates in the Singapore Zoological Reference Collection, Department of Zoology, National University of Singapore (formerly the Zoological Collection of the Raffles Museum). Raffles Bulletin of Zoology, **36:** 1–166.

WHARTON, R. H., D. E. EYLES, MCW. WARREN, AND W. H. CHEONG. 1964. Studies to determine the vectors of monkey malaria in Malaya. Annals of Tropical Medicine and Parasitology, **58:** 56–77.

WHEATLEY, B. P. 1978. Foraging patterns in a group of longtailed macaques in Kalimantan Timur, Indonesia, pp. 347–349. *In* Chivers, D. J., and J. Herbert, eds., Recent Advances in Primatology, vol. 1. Behaviour. Academic Press, London.

———. 1980. Feeding and ranging of East Bornean *Macaca fascicularis*, pp. 215–246. *In* Lindburg, D. G., ed., The Macaques: Studies in Ecology, Behavior and Evolution. Van Nostrand Reinhold, New York.

———. 1982. Adult male replacement in *Macaca fascicularis* of East Kalimantan, Indonesia. International Journal of Primatology, **3:** 203–219.

———. 1984. Copulatory calls of wild macaques, *Macaca fascicularis,* in Kutai Nature Reserve, East Kalimantan, Indonesia. International Journal of Primatology, **5:** 391. (Abstract only.)

———. 1988. Cultural behavior and extractive foraging in *Macaca fascicularis*. Current Anthropology, **29:** 516–519.

———. 1989. Diet of Balinese temple monkeys, *Macaca fascicularis*. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **7:** 62–75.

———. 1991. The role of females in inter-troop encounters and infanticide among Balinese *Macaca fascicularis*, pp. 169–172. *In* Ehara, A., T. Kimura, O. Takenaka, and M. Iwamoto, eds., Primatology Today: Proceedings of the XIIIth Congress of the International Primatological Society, Nagoya and Kyoto, 18–24 July 1990. Elsevier Science, Amsterdam.

Wheatley, B. P., A. Fuentes, and D. K. Harya Putra. 1993. The primates of Bali. Asian Primates, **3**(1–2): 1–2.

Wheatley, B. P., and D. K. Harya Putra. 1994. The effects of tourism on conservation at the Monkey Forest in Ubud, Bali. Revue d'Ecologie (Terre & Vie), **49:** 245–257.

Whitmore, T. C. 1972. The Gunong Benom Expedition 1967. 2. An outline description of the forest zones on north-east Gunong Benom. Bulletin of the British Museum (Natural History), Zoology, **23**(2): 11–15.

Whitten, A. J., S. J. Damanik, J. Anwar, and N. Hisyam. 1984. The Ecology of Sumatra. Gadjah Mada University Press, Yogyakarta, xiv + 583 pp.

Willink, H. D. T. 1905. Mammalia voorkomende in Nederlandsh-Indië. Natuurkundig Tijdschrift voor Nederlandsch-Indië, **65:** 153–345.

Wilson, C. C., and W. L. Wilson. 1973. Final Report: Census of Sumatran Primates, Unpublished. Regional Primate Research Center, University of Washington, Seattle, 24 pp.

———. 1975. The influence of selective logging on primates and some other animals in East Kalimantan. Folia Primatologica, **23:** 245–274.

———. 1977. Behavioral and morphological variation among primate populations in Sumatra. Yearbook of Physical Anthropology, **20:** 207–233.

Wroughton, R. C. 1915. Bombay Natural History Society's Mammal Survey of India, Burma and Ceylon. Report No. 17. Journal of the Bombay Natural History Society, **23:** 695–720.

———. 1918. Summary of the results from the Indian Mammal Survey of the Bombay Natural History Society. Journal of the Bombay Natural History Society, **25:** 547–598.

Yanuar, A. 1994. Survey of the banded leaf monkey (*Presbytis femoralis rhionis*) on Bintang Island, Indonesia. Asian Primates, **3**(3–4): 1–2.

Yanuar, A., and J. Sugardjito. 1993. Population survey of primates in Way Kambas National Park, Sumatra, Indonesia. Tigerpaper, **20**(3): 30–36.

Yin, U Tun. 1954. Wildlife preservation and sanctuaries in the Union of Burma. Journal of the Bombay Natural History Society, **52:** 264–284.

———. 1967. Wild Animals of Burma. Rangoon Gazette, Rangoon, 301 pp.

Yoshiba, K. 1964. Report of the preliminary survey on the orang-utan in North Borneo. Primates, **5:** 11–26.

Yoshida, T., T. Shimizu, F. Cho, and N. Goto. 1993. Relative growth of physiques in laboratory-bred cynomolgus monkeys: A longitudinal study during the first 6 years of life. Experimental Animals, **42:** 435–441.

Zelebor, J. [1869]. Säugethiere, pp. 1–42. *In* Reise der österreichischen Fregatte 'Novara' um die Erde .... Zoologischer Theil, Bd. I. Kaiserlich-Königlichen Hof- und Staatsdruckerei, Wien. [For date of publication, see Zoological Record, **1871:** 2.]

Zimmermann, E. A. W. 1780. Geographische Geschichte des Menschen und der vierfussigen Thiere, vol. 2. Weygandschen Buchhandlung, Leipsig, 432 pp.

Zollinger, H. 1845. Land- en volkenkunde. Een uitstapje naar het eiland Balie. Tijdschrift voor Neêrland's Indië, **7**(4): 1–56.

———. 1847. Land- en volkenkunde. Het eiland Lombok. Tijdschrift voor Neêrland's Indië, **9**(2): 177–205.

Zuckerman, S. [1933]. The menstrual cycle of the primates.—Part VI. Further observations on the breeding of primates, with special reference to the suborders Lemuroidea and Tarsioidea. Proceedings of the Zoological Society of London, **1932:** 1059–1075. [For date of publication, see Proceedings of the Zoological Society of London, **1933:** 229.]

Zumpe, D., and R. P. Michael. 1983. A comparison of the behavior of *Macaca fascicularis* and *Macaca mulatta* in relation to the menstrual cycle. American Journal of Primatology, **4:** 55–72.

———. 1990. Effects of the presence of a second male on pair-tests of captive cynomolgus monkeys (*Macaca fascicularis*): Role of dominance. American Journal of Primatology, **22:** 145–158.

Appendix 1: Specimens Examined (Total 2,049)

Macaca fascicularis fascicularis,
Total 1,550

SKINS AND SKULLS, 739

CAMBODIA, 2. *Mainland* (2), Siemreab—MNHN 1929.460; no locality—MNHN 1961.611.

INDONESIA, 456. *Bali* (21), Banjoe Wetan—MZB 6521–6523; Batoe-meringgit—MZB 2001; Bratan, Gunung, AMNH 107555–107557; Desa Poetjang—RMNH Coll. No. E85 (external measurements from Sody, 1933, p. 94); Gilimanuk—AMNH 107561–107568; Gitgit—NMS 16632; Jembrana—RMNH Coll. No. E139 (external measurements from Sody, 1933, p. 94); Sendang—RMNH Coll. Nos. E34, E64, E74 (external measurements for all three from Sody, 1933, p. 94); *Bangka* (4), Pamuja, Tanjung—USNM 124863; Rengsam, Tanjung—USNM 124710; no locality—RMNH Coll. Nos. Bk52, Bk53; *Batam* (4) "Tanjong Sauh"—BM(NH) 1909.4.1.29, BNHS 5080; Tanjong Turut—BM(NH) 1909.4.1.27, 1909.4.1.28; *Bawean* (8), no locality—MZB 1841–1846, USNM 151829, 151830; *Belitung* (2), Batu, Tanjung—USNM 124969, 124970; *Bengkalis* (1), Kapos Tinggi—USNM 143582; *Benua* (2), no locality—USNM 101638, 101639; *Bintan* (8), north coast—USNM 115676; Pasir Panjang—BM(NH) 1909.4.1.26, USNM 115677; Sungei Biru—BM(NH) 1909.4.1.23–1909.4.1.25; no locality—ZRC 4-093, 4-094; *Borneo: Kalimantan* (93), Ambawang, Sungai—USNM 142225; Badang—AMNH 103730, 103731, 106024–106026, MZB 6513; Berau, Sungai—USNM 196817–196822; Birang, Sungei—USNM 196825 (includes skinned head in fluid); Buntok—BM(NH) 1910.4.5.23; Goson Djerong—USNM 196814; Hantakan—USNM 521837; Karangintan—BM(NH) 1910.4.5.22; Karangmumus, Sungai—USNM 196816; Karangtigau, Tanjung—USNM 196824; Kembangjanggut—MZB 8130; Liang Koeboeng—RMNH 160, 178; Loa Bambam—USNM 196815; Long Peleben—AMNH 106027, MZB 6514; Mahakam, Sungai—USNM 196813; Merah—MZB 1164; Muaratewe—BM(NH) 1910.4.5.19, 1910.4.5.20; Parit—AMNH 103644–103658, 103660–103663, MZB 6515–6517, ZMB 48005, 48006, 92191; Pelawan, Sungai—USNM 198301; Perbuah—AMNH 107091–107096, 107098, 107099, MZB 6519, 6520; Putussibau—ANSP 14038, 14039, 14044; Riam—AMNH 106283–106285, MZB 6518; Roema Manoeal—RMNH 23, 24; Sembakung, Sungai—MZB 576, 6512; Semitau—RMNH 6; Sintang—ANSP 14037, 14042, 14043; Tangarveng I.—USNM 196804; Telang—USNM 521838; Tibang, Mt.—MCZ 22277; no locality—ANSP 14041, BM(NH) 1856.9.3.6, ZSBS Coll. Nos. 272, 738, 788, 1227, 1354, 1373, 1527; *Bulan* (3), south—USNM 144419; no locality—ZRC 4-098, 4-099; *Durian* (2), no locality—MZB 241, 242; *Flores* (7), Mbura—MZB 2384–2387; Rana Mese—NMS 16630; Sano, Wai—MZB 2388; no locality—BM(NH) 1864.4.12.1; *Galang* (4), no locality—ZRC 4-100–4-103; *Java* (84), Bandung, near—USNM 521839; Bantargebang—MCZ 12757, USNM 156291, 156292, 156295; Banyuwangi—RMNH 959; Batoeraden—RMNH Coll. No. 89C; Bogor—MZB 1884; Camara—MZB 6482; Candiroto—RMNH Coll. No. 107B; Cihara—USNM 156456, 156458; Cikujang—MZB 6483, 6485; Cilacap—BM(NH) 1909,1.5.27, 1909.1.5.28; Cirebon—AMNH 101891, 102016; Ciremay, Gunung—AMNH 102015, 102017–102022; Ciwangi—BM(NH) 1909.1.5.29, 1909.1.5.30; Depok—MCZ 12755 (external measurements from USNM field cat.), 12756; Gedangan—RMNH Coll. Nos. 74, V9, V10; Indramayu—MZB 2961, 2962; Jasinga—MZB 2052, 3189; Java, West—RMNH 2b, 3c, 4h; Kaligoea—MZB 574, 575; Kalipucang—BM(NH) 1909.1.5.19, 1909.1.5.32, 1909.1.5.33; Linggajati—AMNH 101811; Majalengka—AMNH 101808–101810; Pangandaran—BM(NH) 1909.1.5.24; Pangonan—RMNH Coll. No. M40; Pasir Carolina—MZB 6484; Pelabuhanratu, Teluk—USNM 156457, ZRC 4-134; Salak, Gunung—RMNH Coll. No. A147; Sarongen—MCZ 12759; Singkil, Gunung—RMNH 5919o, 5919p, 5919q; Tamadjaija—MCZ 12758; Tamansari—BM(NH) 1954.51, ZRC 4-133; Tasikmalaya—BM(NH) 1909.1.5.31, MZB 1604–1609; Tiloe, Goenoeng—RMNH 5919n; Tjeringin—RMNH Coll. Nos. 13f, 25f, 26f; Wonokojo—RMNH Coll. Nos. Won3, Won4, Won5; no locality—NMS 16628, RMNH 2505a, 2505b, 2527, 3094, 3095, 3097, ZMB 113, ZMUZ 11627 (skin)/11630 (skeleton); *Kangean* (4), no locality—BM(NH) 1910.4.6.1–1910.4.6.4; *Karimata* (2), Pai, Teluk—USNM 125101, 125102; *Karimun* (7), Mensuda Bay—USNM 122849; Monos—BM(NH) 1909.4.1.34, 1909.4.1.35; Pemeral—BM(NH) 1909.4.1.30–1909.4.1.33; *Kundur* (2), Selatbliat—BM(NH) 1909.4.1.36, 1909.4.1.37; *Lagong* (1), no locality—USNM 104853; *Laut* (1), no locality—USNM 104854; *Lingga* (2), no locality—USNM 101602, 101603 (external measurements from Miller, 1906c, p. 276); *Lombok* (3), Pussuk forest—MZB 6528; Sewela—NMS 16634, ZMB 92306; *Mapur* (1), Mentigi—ZRC 4-097; *Matasiri* (1), east coast—USNM 151831; *Mursala* (2), no locality—USNM

114559, 114560; *Natuna Besar* (2), Binjai, Sungai—ZRC 4-139, 4-140; *Nguwal* (6), no locality—ZRC 4-104–4-109; *Nias* (11), Hilisimaetano—ANSP 20404–20406; Lafau—USNM 141372; Samasama—USNM 141371; Siaba, Teluk—USNM 121868–121871; Soliga—MCZ 36029, 36030; *Pelapis Tengah* (1), no locality—MZB 2914; *Penida* (3), no locality—AMNH 107558–107560; *Serasan* (2), no locality—USNM 104852, ZRC 4-144; *Serutu* (1), no locality—MZB 2915; *Siantan* (3), no locality—USNM 101711, ZRC 4-136, 4-137; *Subi-kecil* (3), no locality—ZRC 4-141–4-143; *Sugi* (1), no locality—USNM 115675; *Sumatra* (123), Batangkuis—ZSBS Coll. No. 9; Bungur-Buikt—ZMB A25.09; Deli, Sungai—ANSP 20217, 20219; Goenoengsetan-Meloewak—MZB 6481; Indragiri, Sungai—USNM 113169; Kalianda—AMNH 102904–102906; Kambang—ZMB A25.09; "Kg. Baru"—ZSBS Coll. Nos. 156, 176, 180; Kotabumi—ZRC 4-124; Lesten—MZB 6480; Lubuklinggau—AMNH 102211; Medan—ANSP 20221, ZSBS Coll. Nos. 1/10, 5, 6, 15, 16, 21, 22, 26, 30–32, 35, 36, 42, 45–48, 51–53, 68 (Bruegel), 68 (Widnmann), 76, 79, 82, 89, 91, 92, 101, 105, 134, W2, W11; Medan, forest near—ZSBS Coll. No. 11; Muaradua—AMNH 102763–102770; Padang—RMNH 518, 981, 1051; Padang highlands—RMNH e2; Pajo—BM(NH) 1879.6.28.4; Pematangsiantar—MCZ 35937, 35938; Sandaran Agong—ZRC 4-110; Sanggul, Bukit—AMNH 106565–106569, MZB 6477–6479; Serdang—ZSBS Coll. No. 134; Siulakderas—BM(NH) 1919.11.12.8; Sukadana—AMNH 102907–102910; Sumatra, [east-central]—ZMB A14.08/37; Sumatra, east coast—ZSBS Coll. Nos. 105, 135, 156, 166–168, 174; Sumatra, west coast—BM(NH) 1882.7.24.1; Tanjungmorawa—ZSBS Coll. Nos. 71[b], 72, 137; Tapanuli, Teluk—USNM 114505, 114506; Tapung-kanan, Sungai—ZMB A14.08; Tarusan, Teluk—USNM 141145; Telukbetung—FMNH 14805; Telukpanji—ZRC 4-111; no locality—NHMBa 3347, 3348, RMNH 1479, USNM 271018, ZSBS Coll. Nos. 28, 35, 36, 38, 58, 64, 67, 93, 107, 112, 135, 157, 184, 185, 203–205, 212, 232; *Sumba* (8), Langgaliroe—MZB 6526, 6527, ZMB 92075; Mao Marroe—MZB 867–869; Payeti-Kambaniru—MZB 865, 866; *Sumbawa* (8), Batudulang—MZB 6529, 6530, ZMB 92307, 92308; Dompu—NMS 1025; Kambing, Pulau—MZB 6531; Ntori—ZMB 92309; Oo vicinity—NMS 1026; *Tanahbala* (2), no locality—USNM 121802, 121803; *Timor* (9), Kuatnana—ZSBS 1911/2108; Lelogama—ZSBS 1911/2102, 1911/2104, 1911/2105; Mutis, Gunung—MZB 6524, ZMB 92131, 92132; Nikiniki—MZB 6525; Timau, Fatu—ZSBS 1911/2101; *Tuangku* (3), north coast—USNM 114408–114410; *Uwi* (1), no locality—USNM 101666.

MALAYSIA, 163. *MALAYSIA: SABAH, Banggi* (5), Banggi, Pulau, south—ZRC 4-116–4-118; Karakit—FMNH 140939; Sabor—FMNH 140938; *Borneo* (74), Abai—MCZ 35600, 35606, 35611–35613, 35629, 35641, 35642, 35693, 35694, 35700, 35701, 35722, 35724, 35726, 35727, 35729, 35731, 35732, 35744, 35761; Betotan, ZRC 4-115; Bongkabong—MCZ 37409, 37411, 37412; Darvel Bay—ZMB A86.10; Garau—MCZ 37349, 37351, 37414, 37418; Kampong Bundu Tuhan—USNM 292555–292558; Kampong Kiau—MCZ 37348, 37352, ZRC 4-120, 4-121; Keningau—AMNH 188343; Kenokok ZRC 4-122; Kiaulan—MCZ 37350, 37353; Kinabatangan, Sungai—USNM 19193; Kretam Besar, Sungai—FMNH 68700; Kretam Kechil, Sungai—FMNH 68699; Lahad Datu—ZMB A89.04; Papar—USNM 317190; Ranau—MCZ 37346, USNM 317191–317195; Rayoh—ZRC 4-119; Rugading—MCZ 37357; Sapagaya Forest Reserve—FMNH 68701, 68702; Sibuga Besar, Sungai—FMNH 33545; Talibang—MCZ 37354, 37406, 37413; Tawau—AMNH 31288; Tempasuk, Sungai—MCZ 37417; Tenompok—MCZ 37415, 37416; Tinonkok—MCZ 37347; Tuaran-Kampong Tenghilan Road—MCZ 37355, 37356, 37405, 37408; no locality—USNM 344989–344992; *Sebatik* (2), no locality—USNM 175896 (skin and skull)/AMNH 30620 (postcranial skeleton), USNM 175897. *MALAYSIA: SARAWAK, Borneo* (15), Baram, Batang—BM(NH) 1894.6.12.2, USNM 83945; Belaga or Kalulong, Bukit—BM(NH) 1951.66, 1951.68; Bukar, Sungai—ZRC 4-113; Entawa, Tanjong—BM(NH) 1955.710; Kuching—SMK 092/3, 092/8; Kuching, probably—ZMB 4939; Long Ekang—FMNH 88582; Paku, Saribas—BM(NH) 1955.711, 1955.712; Pelandok, Sungai—ZRC 4-112; Punang, Sungai—ZRC 4-114; Selikan, Bukit—USNM 83944. *MALAYSIA: WEST MALAYSIA, mainland* (29), Benom, Gunong—ZRC 4-065, 4-066; Changkat Mentri—BM(NH) 1955.1510, ZRC 4-064; Cherakah, Bukit—BM(NH) 1955.1516, ZRC 4-069; Dusun Tua—ZRC 4-068; Gaik Liew Estate—BM(NH) 1955.1515; Hantu, Tanjong—ZRC 4-063; Kelang Road—BM(NH) 1971.2611; Melaka—BM(NH) 1875.3.29.1, RMNH 41g; Nanas, Bukit—BM(NH) 1939.180, 1939.181, 1955.1512; Nyalas—ZRC 4-078 (external measurements from Weitzel et al., 1988, p. 107); Pong—BM(NH) 1934.7.18.1; Port Dickson—BM(NH) 1939.229 (skin)/RCS(OM) A85.4 (skull), ZRC 4-073–4-075; Tanjong Panjair—BM(NH) 1955.1514, ZRC 4-067; Tanjong Tuan, Keramat—ZRC 4-072; Telom, Sungai—BM(NH) 1934.7.18.4,

1934.7.18.5; Ulu Ijok—BM(NH) 1934.7.18.2, 1934.7.18.3; no locality—USNM 301758; *Acheh* (1), no locality—BM(NH) 1955.1518; *Aur* (2), no locality—BM(NH) 1955.1520, ZRC 4-080; *Burau* (1), no locality—BM(NH) 1955.1519; *Langkawi* (1), no locality—BM(NH) 1909.11.1.1; *Pemanggil* (2), no locality—BM(NH) 1955.1508, USNM 112500; *Pinang [1]* (8), Pantai Krachut—ZRC 4-062; Telok Bahang BM(NH) 1955.1521, ZRC 4-056–ZRC 4-061; *Pinang [2]* (2), no locality—BM(NH) 1949.426, 1955.1523; *Pintu Gedong* (3), no locality—BM(NH) 1955.1517, ZRC 4-070, 4-071; *Redang* (2), no locality—ZRC 4-054, 4-055; *Tinggi* (5), no locality—BM(NH) 1909.4.1.21, 1909.4.1.22, 1955.1527, ZRC 4-131, 4-132; *Tioman* (11), Juara, Telok—BM(NH) 1908.1.25.1, 1908.2.25.1, 1955.1524, 1955.1525, ZRC 4-125–4-127; Sedagong, ZRC 4-129, 4-130; no locality—BM(NH) 1955.1526 (skin)/ZRC 4-128 (skull), USNM 101744.

PHILIPPINES, 43. *Basilan* (3), Basilan I., east end—USNM 144666; Camp No. 4 and Camp No. 5, between—USNM 144665; Isabela—USNM 125326; *Cagayan Sulu* (1), no locality—USNM 125325; *Mindanao* (39), Bucong—FMNH 65440–65444; Canibongan—FMNH 67737–67739; Gubat—FMNH 67725, 67729–67731; Libu—FMNH 67727, 67728; Mamara—FMNH 67717, 67718; Pulunbato, Mt.—BM(NH) 1880.11.24.1; San Ramon—FMNH 33507–33511; Sigayan—FMNH 67722, 67732, 67740–67742; Situbo—FMNH 67719–67721, 67723, 67724; Tacuta—FMNH 67733–67735; Tampalan—FMNH 67736; Zamboanga—USNM 144667, 144668, 144698,

SINGAPORE, 7. *Singapore* (7), Botanical Garden—ZRC 4-082, 4-084; Changi—BM(NH) 1909.4.1.20; Punggol—BM(NH) 1955.1513, ZRC 4-086; no locality—ZMB 5444, ZRC 4-090.

THAILAND, 60. *Mainland* (32), Aranyaprathet—MCZ 35931; Ban Huai Maenam Noi—FMNH 99649, 99650; Ban Nong Kok—ZRC 4-034; Ban Nong Put—CTNRC (catalog number unknown); Ban Pak Nam Pho—MCZ 23812, 23813, ZRC 4-031; Ban Phra Muang—USNM 83271, 83273; Ban Phu Toie—FMNH 99639, 99640; Ban Sai Kau—BM(NH) 1903.2.6.3; Ban Thap Plik, 1 km E—FMNH 105654; Ban Thap Plik, 1 km NE—FMNH 105653; Kampong Biserat—BM(NH) 1903.2.6.1, 1903.2.6.4; Kantang—ZRC 4-032; Kata Taek—FMNH 99651–99656; Khao Rang Kai—CTNRC (catalog number unknown), FMNH 105689; Laem Sing mountains—USNM 251662; Lat Bua Khao, Sathani—USNM 236631, ZRC 4-033; Tham Hom—FMNH 105649; Tyching—USNM 83274, 83275; *Butang* (1), no locality—BM(NH) 1955.1511; *Chang* (3), no locality—BM(NH) 1915.11.4.7, USNM 201551, ZRC 4-039; *Kut* (8), no locality—BM(NH) 1915.11.4.8–1915.11.4.10, 1976.1826 (skin)/ZRC 4-040 (skull), USNM 201552, 201553 (external measurements from Kloss, 1916a, p. 67), 254741, ZRC 4-041; *Phangan* (2), southwest—ZRC 4-044, 4-045; *Phi Phi Don* (4), no locality—ZRC 4-046–4-049; *Samui* (2), west—BM(NH) 1955.1522, ZRC 4-050; *Talibong* (2), no locality—USNM 83272, ZRC 4-051; *Tarutao* (6), Sungei Adang—BM(NH) 1909.11.1.2, 1909.11.1.3; Telok Wau—BM(NH) 1955.1509, ZRC 4-053; no locality—USNM 123990, 123991.

VIETNAM, 8. *Mainland* (6), Cochin China—BM(NH) 1881.6.30.2, MNHN 1882.2; Ho Chi Minh City—FMNH 33505; Ho Chi Minh City, Zoological Garden—MNHN 1929.459; Sontra Peak, 3.9 km W, 0.3 km S—USNM 356968; Xa Trang Bom—ZRC 4-020 (external measurements from Weitzel et al., 1988, p. 114); *Phu Quoc* (2)—BM(NH) 1928.7.1.10, MNHN 1929.455.

SKINS ONLY, 285

CAMBODIA, 1. *Mainland* (1), no locality—RMNH 38.

CAMBODIA OR VIETNAM, 2. *Mainland* (2), "Camboja or Cochinchine"—BM(NH) 1878.6.17.4, 1878.6.17.5.

INDONESIA, 241. *Bali* (1), Bratan, Danau—BM(NH) 1913.3.6.7; *Bangka* (1), Simpang—ZSBS Coll. No. 25; *Borneo: Kalimantan* (82), Borneo, southeast—RMNH 35v (skull inside); Borneo, southwest—RMNH 32s, 33t, 34u (skulls inside); Kampong Hadjak—IRSN 9796; Karangtigau, Tanjung—USNM 196823; Muaratewe—BM(NH) 1910.4.5.21; Parit—AMNH 103659 (skull not located, cranial measurement from G. H. Albrecht, pers. comm., Oct. 1991), ZMB 92190; Pelaihari—RMNH 36w (skull inside); Perbuah—AMNH 107097; Poelau—RMNH 229 (cf. Hooijer, 1962b, p. 46, no. 48); Rantau—RMNH 4617 (cf. Hooijer, 1962b, p. 44, no. 11); Riam—AMNH 106282; Senoeang—AMNH 107100 (male skin mismatched with female skull); Sintang—ANSP 14036, 14040; no locality—ZMB (unnumbered, 24 Apr. 1902), ZSBS Coll. Nos. 3PS, 4PS, 7PS, 10–12, 15 (juvenile male), 15 (adult male), 16, 21, 36(450), 48, 157, 201, 205, 276, 277, 297, 298, 306, 372, 373, 445(316), 587, 616–618, 694, 701, 709, 710, 730, 740, 741, 743, 749, 764–766, 771, 780, 1013, 1014, 1228, 1358, 1359, 1372, 1378, 1386, 1387, 1414, 1437, 1438, 1452, 1464, 1465, 1477, 1478, 1488, 1505, 1510, 1534, unnumbered (Breugel), unnumbered (Breugel, "von Zengen"); *Java* (25), Bantargebang—MCZ 12760; Gedangan—RMNH (unnumbered); Indramayu—MZB 2939, 2960; Kawarasan—RMNH 2067;

Pangandaran—BM(NH) 1909.1.5.26; Pangrango, Gunung—RMNH 2067, 2067/II (skulls inside); Semarang—ZSBS (unnumbered); Tasikmalaya—MZB 1610; Java, West—RMNH 1, 5e, 6, 7g (skulls inside), 8; no locality—NHMBa 3131, 3161, 3352, RMNH 9i, 10j, 11k, 12l, 13m, 14 (skulls inside); SMTD (unnumbered); *Kambing* (1), no locality—RMNH 30p (skull inside); *Laut* (1), no locality—BM(NH) 1939.1054 (skull inside); *Natuna Besar* (6), Sinubing—BM(NH) 1939.1053 (skull inside); Ulu, Sungai—ZRC 4-138; no locality—BM(NH) 1939.1055, 1964.428 (skulls inside), MCZ 6660, 6661 (skulls inside); *Nias* (1), no locality—ZRC 4-135 (skull not located); *Pejantan* (1), no locality—ZSBS I; *Sumatra* (114), Batangkuis—ZSBS Coll. Nos. 3, 13, 15, 38, 47, 88, 96, 97, 197, 200; "Brandan?"—ZMB 38542; Deli, Sungai—ANSP 20218, 20220 (fetuses in fluid); "I. Lendung"—ZSBS Coll. Nos. 32, 74, unnumbered juvenile; "Kg. Baru"—ZSBS Coll. Nos. 63, 77, 79, 81, 113; Medan—ZSBS Coll. Nos. 1, 6/II, 7, 7/II, 8/II, 9/II, 14, 24, 28 (juvenile), 29, 42/III, 43, 47/II, 52, 58, 60, 62, 67, 67/II, 71, 74, 75, 77, 80, 81, 81/II, 82, 90, 93, 94, 98, 99/II, 100/II, 102, 103, 104, 106, 111, 115, 116/VIII, 119, 124/III; Menam—ZMB 40820; Padang—RMNH 44x, 45y, 46z (skulls inside), 47a, 48b, 49c, 50d (skulls inside), ZMUZ 11625, 11626; Palembang, Kotamady—ZSBS Coll. Nos. 22, 23; Pangkalansusu—USNM 502457 (infant in alcohol); Sumatra, east coast—ZSBS Coll. Nos. 158, 170, 171, 189; Sumatra, south—ZMB 38540, 38541; Tanjungmorawa—ZSBS Coll. Nos. 60, 73[b], 75[b]; no locality—MNHN 362/233, ZMB Coll. Nos. 9, 25, unnumbered juvenile, unnumbered male, ZMUZ 11619 (skull inside), ZSBS Coll. Nos. 14, 27, 52, 61, 68, 70, 78, 78/1905, 95, 111, 115, 117, 123, 141, 155, 198, 199, 201, 202, 216, 235, 236, 242; *Sumbawa* (1), Batudulang—NMS 16631 (cranial measurements from Mertens, 1936, p. 319, and G. H. Albrecht, pers. comm., Oct. 1991); *Timor* (6), Amarassie—RMNH 29o (skull inside); Bokong—ZSBS 1911/2110; Lelogama—ZSBS 1911/2103, 1911/2106, 1911/2107; Nikiniki—ZMB 92133; *island unknown* (1), Sunda Islands—ZMB 111.

INDONESIA OR MALAYSIA, 1. *Borneo* (1), Sendung—ZMB (unnumbered).

MALAYSIA, 24. *MALAYSIA: SABAH, Borneo* (2), Abai—MCZ 35695; Tuaran—MCZ 37407 (male skin mismatched with female skull); *Sebatik* (1), no locality—AMNH 30619. *MALAYSIA: SARAWAK, Borneo* (15), Baram, Batang—NMS 4689, SMK 092/13 (skull inside); Belaga or Kalulong, Bukit—BM(NH) 1951.67 (female skin mismatched with male skull); Dulit, Bukit—SMK 092/9 (skull inside); Kuching—SMK 092/5 (skull inside); Kuching, 10th mile—SMK 092/12 (skull inside); Lingga—SMK 092/2, 092/7 (skulls inside); Miri—MCZ 6662 (skull inside); Miri district—NHMBe 817; Penrissen, Gunong—SMK 092/4, 092/11/A3.312 (skulls inside); Punang, Sungai—SMK 092/6, 092/10; Segobang, Sungai—SMK 092/11/4713 (skull inside); *Dindding* (1), no locality—BM(NH) 1905.3.1.3. *MALAYSIA: WEST MALAYSIA, mainland* (4), Melaka—MNHN 1848.401, 1848.402 (skulls inside), RMNH 40, 42 (skull inside); *Aur* (1), no locality—ZRC 4-079.

PHILIPPINES, 3. *Mindanao* (1), Zamboanga del Sur Prov.—SICONBREC 1586 (living captive); *Tawitawi* (2), no locality—SICONBREC 1225, 1475 (living captives).

SINGAPORE, 5. *Singapore* (5), Botanical Garden—ZRC 4-081 (skull inside), 4-083; Punggol—ZRC 4-087, 4-088; Sembawang, Sungai—ZRC 4-089.

THAILAND, 3. *Mainland* (3), Bangkok—MNHN 1219 (skull inside); Ban Thap Plik, 1 km E—FMNH 105655 (infant in fluid); Kampong Biserat—BM(NH) 1903.2.6.2.

VIETNAM, 5. *Mainland* (5), Ho Chi Minh City—NMS 5786, 5787; Ho Chi Minh City, Botanical Gardens—BM(NH) 1928.7.1.9, MNHN 1929.457; Tay Ninh—BM(NH) 1928.7.1.7.

SKULLS ONLY, 526

INDONESIA, 434. *Bali* (2), Bratan, Danau—BM(NH) 1913.3.6.5 (possibly skull of BM(NH) 1913.3.6.7, skin only); Jembrana—RMNH Coll. No. E136 (external measurements from Sody, 1933, p. 94); *Bangka* (173), Jebus—RMNH Coll. No. Bk7; no locality—RMNH Coll. No. Bk74, ZLUU 1, 2, 4–16, 18, 20, 22, 25–30, 32–37, 39–43, 45–62, 64–67, 73–75, 77–105, 106 (juvenile cranium only), 106 (adult mandible only), 107–112, 113, (juvenile cranium only), 113 (adult mandible only), 114–116, 117 (cranium and mandible), 117 (mandible only), 118, 119, 120 (cranium only), 120 (mandible only), 121–134, 136, 137, 140–165, 167–171, 173–178, 179 (mandible only), 181–184 (mandibles only), 185, 187–189 (mandibles only), ZSBS 1964/232; *Bintan* (2), Pasir Panjang—ZRC 4-092, Sungei Biru—ZRC 4-091; *Borneo: Kalimantan* (24), Borneo, southeast—RMNH p, ZMB 38543; Gosong Djerong—USNM 196827; Jembayan, Sungai—USNM 199181, 199183, 199184, Karangan, Sungai—USNM 198300; Kariorang—ZMB 48494, unnumbered; Loa Bambam—USNM 196826; Long Peleben—MNHN 1974;144; Purukcahu—BM(NH) 1910.4.5.18; Tanjung—NHMBa 3747; no locality—AMNH 107100 (female skull mismatched

with male skin), RCS(OM) G166.31, ZSBS 1944/3009, Coll. Nos. 12-4–12-6, 20, 363/368, 748, 848, 864; *Java* (123), Bandung—RMNH 3438, ZLUU (unnumbered); Cirebon—NMS 6974, RCS(OM) A85.6, A85.61–A85.65; Gedangan—RMNH Coll. V1, unnumbered adult males (2), unnumbered infant (1); Java, West—RMNH cat. ost. b–cat. ost. e (4); Jockaboemi—ZMB A34.09; Malabar–ZLUU (unnumbered); Manggis—ZSBS 1909/4062, 1909/4601, unnumbered specimens (7), Margomulio, Gunung—ZSBS (unnumbered); Ngawi—RMNH 4660; Pangandaran BM(NH) 1909.1.5.25 (with mounted skin, not examined); Pangrango, Gunung—NHRM Z2923–Z2925, Z3146–Z3150, Z3152–Z3154, Z3165, Z3166, Z3292, Z3293, Z3295, Z3314, Z3316, Z3320–Z3322, Z3324 (adult female), Z3324 (subadult female), Z3325, Z3328–Z3330; Salak, Gunung—RMNH Coll. Nos. A137, A221; Tjeringin—RMNH Coll. No. 12f; Tulungagung—RMNH 4650–4655; no locality—ANSP 12, NHMBa (unnumbered), NHRM Z2698–Z2700, Z2702, Z2709–Z2711, Z2718–Z2720, Z2726–Z2729, Z2730 (mandible only), Z2731, Z2739, Z3151, NMS 1044, 1100, RMNH 2615i, 2651b–2651h, 2683, 3087–3089, 3099, 3106, 3107, 3109, 3110, 3113–3115, 3177–3179, 3188, 3229, 4644, 6684, cat. ost. a, cat. ost. i–cat. ost. l (4), cat. ost. n, ZMB 43867; *Karimun* (1), Pongka, Kampung—USNM 122848; *Kundur* (2), no locality—ZRC 4-095, 4-096; *Lombok* (2), Suranadi—PRI 1400, no locality—BM(NH) 1920.1.26.3; *Matasiri* (1), east coast—USNM 154368; *Mursala* (1)—USNM 114561; *Nias* (5), Siaba, Teluk—USNM 121872–121874; no locality—ZMB 48417, 48419; *Padang* (1), north coast—USNM 143583; *Sumatra* (87), Balbalan—ZMB 34005; Batangkuis—ZSBS Coll. Nos. 110, 114; Bengkulu—RMNH 4648; Bukittinggi—ZMB 34241; Indragiri district—NHMBa 3774–3776, 3778–3781, ZMUZ 11668; Kateman, Sungai—USNM 123147; "Kg. Baru"—ZSBS Coll. Nos. 62 (adult male), 113; Lahat—NHMBa 1805, 4829; Lampung, Propinsi—ZSBS (unnumbered); Lubuksikaping—RMNH 4659; Medan—MCZ 41167; ZSBS Coll. Nos. 28 (adult male), 67, 151; Mempura—ZMB A14.08 (subadult male), A14.08/02 (infant); Padang—ZMUZ 11652; Pagansan—ZMB A14.08 (subadult female), A14.08/03–A14.08/05; Pangkalan—RMNH 4645–4647; Pangkalansusu—USNM 536025; Pap-ka—ZMB A14.08; Payakumbuh—RMNH 4649; Rawas—ZMB 34025; Rokan-kanan, Sungai—ZMB A14.08/08, A14.08/I/07, A14.08/II/01; Serangjaya-hilir—RMNH Coll. Nos. F144, F145; Siak Copatta—SMB A14.08/53; Sijunjung—RMNH w; Soekaranda—ZMB A22.05; Sumatra, [east-central]—ZMB A14.08 (infant), A14.08 (juvenile female), A14.08 (subadult male); Sumatra, east coast—ZSBS Coll. Nos. 157, 165, 169, 175; Tamiang—RMNH Coll. No. F143; Tanjungmorawa—RMNH q, z, unnumbered skeleton, ZSBS Coll. Nos. 71 (adult male), 73 (subadult male), 75 (adult female); Wonosobo—RMNH Coll. No. 60; no locality—NMS 1045, 1046, 1101, 16635/IE.2.a, RMNH 1839, 1872a (female), 1872a (male), 3322, 4658, ZMB Coll. Nos. 6 (juvenile), 6 (adult male), 15, unnumbered female, unnumbered male, ZSBS Coll. Nos. 33, ?51 (adult male), 62 (subadult male), 93, 105, 109, 112, 115–117, 120, 202; *Sumbawa* (4), Dompu—NMS 1027, 16633; Semongka—PRI 1399; no locality—NHMBa 5341; *Tanahmasa* (1), no locality—USNM 121836 (external measurements recorded on skull tag); *Timor* (2), Bokong—ZSBS 1911/2109; no locality—NHMBa 2703; *Tuangku* (2), north coast—USNM 114411, 114643 (external measurements recorded on skull tag); *island unknown* (1), Sunda Islands—NHMBa 2981.

MALAYSIA, 82. *MALAYSIA: SABAH, Borneo* (65), Abai—MCZ 25699, 25711, 35569, 35571, 35576, 35578, 35587, 35608, 35619, 35622, 35623, 35626, 35633, 35634, 35643, 35651, 35652, 35655, 35656, 35658, 35661, 35673, 35677, 35681, 35725, 35730, 35734–35736, 35738, 35739, 35741, 35742, 35746, 35748–35755, 35758 (cranium embedded in plaster), 35759, 35764–35767, 35768/491, 37663, 37664 (external measurements for 50 of these 51 specimens, all except MCZ 35622, are listed on expedition record cards); Kinabalu, Mt.—MCZ 37781–37786, 37787–37789 (three mandibles only); Kinabatangan, Sungai—USNM 19192; Sandakan, 8 mi W—FMNH 33547; Segama, Sungai—ZMB A85.10; Talibang—MCZ 57836; Tuaran—MCZ 37407 (female skull mismatched with male skin). *MALAYSIA: SARAWAK, Borneo* (12), Baram, Batang—ANSP 6149, BM(NH) 1894.6.12.13; Belaga or Kalulong, Bukit—BM(NH) 1951.67 (male skull mismatched with female skin), 1951.69, 1951.70; Dulit, Bukit—ZMB (unnumbered); Jumpit—ZMB A1870; Kuching—SMK Coll. Nos. 3-315, 3-320; Melinau Gorge—BM(NH), unnumbered mandibular fragment; Mulu, Gunong—BM(NH) 1894.6.12.1; Puram—ANSP 6113. *MALAYSIA: WEST MALAYSIA, mainland* (5), Benom, Gunong, northeast slope—BM(NH) 1979.2869; Nyalas—ZRC 4-076 (external measurements from skull tag), 4-077 (external measurements from Weitzel et al., 1988, p. 107); Telok Anson—NHRM 3259, 3260.

PHILIPPINES, 2. *Jolo* (1), Crater Lake Mountain—USNM 125324; *Mindanao* (1), Zamboanga—ZMB A2920 (external measurements from Martens, 1876, p. 206).

SINGAPORE, 1. *Singapore* (1), Botanical Garden—ZRC 4-085.

THAILAND, 4. *Mainland* (3), Ban Sakaerat—NHRM Coll. No. 1/3; Kampong Biserat—SMTD B4346; Pattani—SMTD B4348; *Tarutao* (1), no locality—USNM 123992.

VIETNAM, 3. *Mainland* (3), Cochin China—MNHN 1869.297; Ho Chi Minh City, Botanical Gardens—MNHN 1962.1445; Ho Chi Minh City, Zoological Garden—MNHN 1962.1443.

Supplementary information has been derived from 12 unexamined specimens of *M. f. fascicularis* collected at the following localities: *INDONESIA, Borneo: Kalimantan,* Kaboerau (Gyldenstolpe, 1920, pp. 14–15); Loa Bambam (Coll. No. 10, H. C. Raven field catalog, USNM); Long Pangian (Gyldenstolpe, 1920, pp. 13–14); Pelaihari (Kohlbrugge, 1896a, p. 185); *Java,* Kediri district—ZSBS 1911/2363, 1911/2364 (specimens not seen, cranial measurements from G. H. Albrecht, pers. comm., Oct. 1991); Tengger, Pegunungan (Kohlbrugge, 1896b, p. 280); *Sumatra,* Labbuhandeli vicinity (Hagen, 1890, p. 82); *Sumbawa,* Dompu—NMS 16629 (not seen, cranial meausurements from Mertens, 1936, p. 319, and G. H. Albrecht, pers. comm., Oct. 1991). *MALAYSIA: SABAH, Borneo,* Abai—MCZ 35768/492 (not seen, external measurements from expedition record cards). *PHILIPPINES, Mindanao,* Zamboanga—2 specimens (Martens, 1876, p. 206).

Macaca fascicularis aurea, Total 55

SKINS AND SKULLS, 44

BURMA, 33. *Mainland* (23), Ban Sadein—AMNH 54968; Haungtharaw—ZSI 11989; Tagoot, BNHS 5073, 5075; Taungbyauk Chaung—BM(NH) 1936.9.10.8, 1936.9.10.9, 1936.9.10.12, 1936.9.10.13; Tavoy R.—BM(NH) 1936.9.10.10, 1936.9.10.14; Tenasserim—BM(NH) 1914.12.8.15–1914.12.8.18, BNHS 5070, 5076, 5079, FMNH 82804, ZRC 4-021–4-023; Wimpong—BM(NH) 1885.8.1.15; Ye Forest—BM(NH) 1910.12.24.1; *Kadan* (1), no locality—BM(NH) 1925.7.2.1; *Kathema* (4), no locality—BM(NH) 1936.9.10.4–1936.9.10.7; *Lanbi* (1), no locality—USNM 104442; *Letsok-aw* (1), no locality—USNM 124176 (cranium missing); *Mibya* (2), no locality—BM(NH) 1936.9.10.3, 1910.9.10.11; *Zadetkyi* (1), no locality—USNM 111898.

THAILAND, 11. *Mainland* (11), Ban Tamrong Phato—CTNRC (catalog number unknown), FMNH 99641, 99642, 99644–99648; Wong, Nam Mae, 65 km E of Um Pang—AMNH 54677, BM(NH) 1924.9.2.8; Wong, Nam Mae, 85 km E of Um Pang—AMNH 54679.

SKINS ONLY, 8

BURMA, 6. *Mainland* (6), Arakan Div.—ZSI 11990; Haungtharaw—ZSI 4389, 4390, 4392 (skulls inside all three); Mergui, BNHS 5078, ZSI 5238.

COUNTRY UNKNOWN, 2. "Bengale"—MNHN 362/234 (lectotype), 368/247.

SKULLS ONLY, 3.

BURMA, 3. *Mainland* (2), Mergui—BM(NH) 1856.5.6.16; Tenasserim—BM(NH) 1972.1312; *Lanbi* (1), no locality—USNM 124112.

Supplementary information has been derived from a published photograph of *M. f. aurea* observed at *BANGLADESH, mainland,* Whykeong Union Council (M. A. R. Khan, 1985, fig. 15).

Macaca fascicularis aurea/ Macaca fascicularis fascicularis Contact Zone or *Macaca fascicularis/Macaca mulatta* Contact Zone, Total 45

SKINS AND SKULLS, 41

BURMA, 11. *Mainland* (10), Pakchan R., near Maliwun—AMNH 54972; Pakchan R., near Bankachon—BM(NH) 1914.12.8.11, 1914.12.8.14; Thagyet—BM(NH) 1914.12.8.12, 1914.12.8.13, BNHS 5071, 5072, 5074; FMNH 82805, ZRC 4-024; *Ru* (1), no locality—BMNH 5077.

LAOS, 3. *Mainland* (3), Thateng, Muang—AMNH 87266, ANSP 15136, 15138 (external measurements from AMNH catalog).

THAILAND, 26. *Mainland* (22), Ban Mae Na Ree—FMNH 99657–99659; Ban Na—535154; Ban Nam Lai Tai—CTNRF (catalog number unknown), FMNH 99660–99663, 99666, 99667; Chumphon, Khlong—ZRC 4-029, 4-030; Nakhon Si Thammarat—USNM 251661, ZRC 4-035–4-037; Pak Chong, Sathani—ZRC 4-025, 4-026; Phu Phan—USNM 307714 (skin)/307732 (skull); Pran Buri, Mae Nam—ZRC 4-027, 4-028; *Naka Yai* (1), no locality—ZRC 4-043; *Phayam* (1), no locality—ZRC 4-038; *Rang Yai* (1), no locality—ZRC 4-042; *Yao Noi* (1), no locality—ZRC 4-052.

VIETNAM, 1. *Mainland* (1), Lac Giao—FMNH 46523.

Skins Only, 3

LAOS, 2. *Mainland* (2), Thateng, Muang—AMNH 87270, 87271.

THAILAND, 1. *Mainland* (1), Ban Nam Lai Tai—FMNH 99664 (infant in fluid).

Skull Only, 1

THAILAND, 1. *Mainland* (1), Nakhon Si Thammarat—USNM 251660.

M. f. philippinensis,
Total 98 (Skins and Skulls, 53; Skins Only, 15; Skulls Only, 30)

Probably *M. f. philippinensis,* Total 15
(Skin Only, 1; Skulls Only, 14)

M. f. philippinensis/M. f. fascicularis
Contact Zone, Total 110
(Skins and Skulls, 82; Skins Only, 5; Skulls Only, 23)

Probably *M. f. philippinensis/M. f. fascicularis*
Contact Zone, Total 12
(Skins and Skulls, 2; Skin Only, 1; Skulls Only, 9)

For detailed lists of *M. f. philippinensis* and *M. f. philippinensis/M. f. fascicularis* contact zone specimens examined, see Fooden (1991, p. 32). Five revisions have been made to the previously published lists, as follows:

1. BM(NH) 1877.10.6.2, Mindanao: Agusan River, is now recognized as a composite consisting of the skin of an infant or juvenile mismatched with the skull of a subadult female (see above, *M. f. philippinensis* account, Distribution). This skin and skull, formerly assigned to *M. f. philippinensis,* are now tentatively reassigned, as two separate specimens, to "Probably *M. f. philippinensis/M. f. fascicularis* Contact Zone."
2. BM(NH) 1877.10.6.1, skin and skull, Mindanao: Surigao, collected near the Agusan River (see above) and formerly assigned to *M. f. philippinensis,* is now also tentatively reassigned to "Probably *M. f. philippinensis/M. f. fascicularis* Contact Zone."
3. BM(NH) 1872.8.20.5, Negros I., S (*M. f. philippinensis/M. f. fascicularis* Contact Zone), formerly known only from its skin, is now known from both skin and skull.
4. BM(NH) 1872.9.20.1, skin and skull, Negros I., S (*M. f. philippinensis/M. f. fascicularis* Contact Zone), not included in previous lists, was examined after those lists were prepared.
5. FMNH 65453, skin only, formerly listed as of unknown origin and undetermined subspecies, is now known to have been collected at Negros: Amio riverbank (*M. f. philippinensis/M. f. fascicularis* Contact Zone).

Supplementary information has been derived from two unexamined specimens of *M. f. philippinensis* collected at the following localities: *PHILIPPINES, Luzon,* Nagpartian—USNM 144677 (transferred to Bureau of Science, Manila; external measurements from Hollister, 1913, p. 330); *Palawan,* Brookes Point—FMNH 62916 (infant in fluid, not seen; external measurements from field catalog).

***Macaca fascicularis umbrosa,* Total 8**

Skins and Skulls, 8

INDIA, 8. *Great Nicobar* (3), Kopenheat—USNM 111799; no locality—USNM 111792, 111793; *Katchall* (2), no locality—USNM 111801, 111802; *Little Nicobar* (3), no locality—USNM 111795 (holotype), 111796, 111797.

***Macaca fascicularis fusca,* Total 19**

Skins and Skulls, 12

INDONESIA, 12. *Simeulue* (12), Ajer Dingin—BM(NH) 1923.10.7.1; Dalam, Lhok—USNM 114162, 114163, 114164 (holotype), 114165–114167; Labuhanbajau—USNM 114169; Sibaboh, Lugu—USNM 114168, 121511–121513.

Skins Only, 7

INDONESIA, 7. *Simeulue* (7), Ajer Dingin—BM(NH) 1923.10.7.2; Sinabang—RMNH Coll. Nos. 20, 140, 1160, 1161; no locality—RMNH 574, 1330.

***Macaca fascicularis lasiae,* Total 2**

Skins and Skulls, 2

INDONESIA, 2. *Lasia* (2), no locality—USNM 114247, 114248 (holotype).

***Macaca fascicularis atriceps*, Total 11**

SKINS AND SKULLS, 11

THAILAND, 11. *Khram Yai* (11), no locality—BM(NH) 1939.891, 1939.892, USNM 236618–236621, 236622 (holotype), ZRC 4-012, 4-013 (skull)/4-733 (skin), 4-015, 4-016. For external measurements of ZRC specimens, cf. Kloss (1921, p. 77) and Weitzel et al. (1988, p. 105).

***Macaca fascicularis condorensis*, Total 16**

SKINS AND SKULLS, 11

VIETNAM, 11. *Ba* (3), Ben Dam, 1.2 km W, 0.1 km S—USNM 357242; Ben Dam, 1.7 km W—USNM 357239; Ben Dam, 3.1 km W, 0.6 km S—USNM 357241; *Con Son* (8), Airfield building, 2.5 km E, 0.7 km N—USNM 357014; Airfield building, 3.3 km E, 0.6 km N—USNM 357349; no locality—BM(NH) 1939.893, 1939.894, 1947.1498 (holotype), 1955.1528, ZRC 4-018, 4-019.

SKINS ONLY, 2

VIETNAM, 2. *Con Son* (2), no locality—MNHN 1882.5 (skull inside), ZRC 4-017.

SKULLS ONLY, 3

VIETNAM, 3. *Ba* (1), Ben Dam, 1.7 km W—USNM 357240. *Con Son* (2), Airfield building, 0.5 km N, 4 km E—USNM 357401; no locality—MNHN 1882.1.

***Macaca fascicularis tua*, Total 4**

SKINS AND SKULLS, 4

INDONESIA, 4. *Maratua* (4), no locality—USNM 197660–197662, 197663 (holotype).

***Macaca fascicularis karimondjawae*, Total 9**

SKINS AND SKULLS, 6

INDONESIA, 6. *Karimunjawa* (6), no locality—MZB 1455–1458, 2717, 2718.

SKIN ONLY, 1

INDONESIA, 1. *Karimunjawa* (1), no locality—RMNH 10608 (holotype). The skull of this specimen was subsequently located and examined by G. H. Albrecht (pers. comm., Oct. 1991), who kindly provided the measurement of its greatest length, excluding incisors.

SKULLS ONLY, 2

INDONESIA, 2. *Karimunjawa* (1), no locality—MZB 1454; *Kemujan* (1), no locality—MZB 2720.

***Macaca fascicularis*, Subspecies Undetermined, Total 95**

SKINS AND SKULLS, 15

MAURITIUS, 3. *Mauritius* (3), Plaine Sophie—BM(NH) 1950.1458; no locality—BM(NH) 1861.6.1.6, 1909.3.12.1.

PHILIPPINES, 10. See Fooden (1991, p. 33).

THAILAND, 2. *Mainland* (2), locality unknown—BM(NH) 1860.4.20.2, ZSBS Coll. No. 95.

SKINS ONLY, 20

?*BURMA*, 3. *Mainland* (3), "Rangoon"—RMNH 51/j, 52/k; no locality—BNHS Coll. No. 7.

MAURITIUS, 2. *Mauritius* (2), Kanaka—BM(NH) unnumbered female; no locality—RMNH L-2 (skin inside).

PHILIPPINES, 9. See Fooden (1991, p. 33) and above, *M. f. philippinensis/M. f. fascicularis* Contact Zone, FMNH 65453.

THAILAND, 5. *Mainland* (5), Phet Buri—MNHN 1220 (lateral facial crest not examined); no locality—AMNH 37208, MNHN 462, 767, ZSBS Coll. No. 89.

COUNTRY UNKNOWN, 1. No locality—ZRC 4-123.

SKULLS ONLY, 60

?*BURMA*, 2. *Mainland* (2), "Bengalen"—NMS 1043, ZMB 116.

MAURITIUS, 1. *Mauritius* (1), no locality—BM(NH) 1955.12.26.43.

PHILIPPINES, 52. See Fooden (1991, p. 34).

THAILAND, 5. *Mainland* (5), Ping, Nam Mae—AMNH 54681 (external measurements from AMNH catalog); "13°45′N, 99°25′E"—BM(NH) 1914.8.22.3, 1914.8.33.4; no locality—ZSBS Coll. Nos. 27, 123.

Appendix 2: Gazetteer of Non-Philippine *Macaca fascicularis* Localities

Except as noted previously (see Introduction), locality names listed as primary entries in this gazetteer preferentially are official names approved in gazetteers published by the U.S. Board on Geographic Names (USBGN; Bangladesh, 1976; Burma, 1966a; Cambodia, 1971a; India, 1952; Indonesia, 1982; Laos, 1973; Malaysia, Singapore, and Brunei, 1970; Thailand, 1966b; Vietnam, 1964, 1971b); in addition to providing lists of place-names and coordinates, USBGN gazetteers also contain useful glossaries of generic geographic terms for each country. Macaque localities that are not listed in USBGN gazetteers are spelled here as in the original sources. Secondary entries, with cross-references to corresponding primary entries, indicate variant spellings or alternate locality names that appear on specimen tags, in published literature, or in unpublished manuscripts on macaques. No secondary entries are supplied for variant spellings of Indonesian place-names that contain "oe" in place of "u." For a gazetteer of Philippine macaque localities, see Fooden (1991, p. 34).

The sequence of information presented in primary entries is as follows:

1. Locality name.
2. Altitude, if reported by collector or observer.
3. Name of island (for noncontinental localities), italicized.
4. Name of country, in capital letters.
5. Coordinates of locality (principal sources—USBGN gazetteers; published or unpublished field notes of collectors or observers).
6. Date of collection or observation.
7. Name of collector or observer.
8. Bibliographic reference (in parentheses) to published or unpublished field notes, if any.
9. Abbreviated name of museum (see Introduction) where specimens are preserved.
10. Number of specimens available (with indication of part preserved, if skin and skull are not both present).
11. Abbreviated subspecific identification: ATR = *M. f. atriceps*; AUR = *M. f. aurea*; AUR/FAS/MUL = *M. f. aurea/M. f. fascicularis* contact zone or *M. fascicularis/M. mulatta* contact zone; CON = *M. f. condorensis*; FAS = *M. f. fascicularis*; FUS = *M. f. fusca*; KAR = *M. f. karimondjawae*; LAS = *M. f. lasiae*; TUA = *M. f. tua*; UMB = *M. f. umbrosa.*
12. Locality code as indicated in distribution maps (Fig. 2A–C).

Abai; *Borneo,* MALAYSIA: SABAH; 5°42′N, 118°23′S; collected 2 Jun.—3 Aug. 1937 by S. L. Washburn and A. H. Schultz (see Coolidge, 1940, p. 124); MCZ, 73 (including 1 skin only, 51 skulls only). FAS; C:Sab-19.

Acheh, Pulau, MALAYSIA: WEST MALAYSIA; 2°39′–2°41′N, 103°46′–103°47′E; collected 18 Jul. 1915 by H. C. Robinson; BM(NH), 1. FAS; B:SCS-2.

Adenare. See *Adonara, Pulau.*

Adonara, Pulau, Lesser Sunda Islands, INDONESIA; 8°14′–8°25′S, 123°00′–123°20′E; reported present before 1937 by R. Mertens (1936, p. 319). FAS; C:LS-21.

Agung, Gunung, See Desa Poetjang, Gunung Agung.

Ai Beta; *Pulau Sumbawa,* Lesser Sunda Islands, INDONESIA; ca. 8°33′S, 117°25′E; blood samples taken Jul. 1981–Jan. 1982 by Y. Kawamoto, Tb. M. Ischak, and J. Supriatna (1982a, p. 58). FAS; C:LS-8.

Airabu, Pulau, INDONESIA; 2°43′–2°48′N, 106°12′–106°15′E; observed 18 Aug. 1899 by W. L. Abbott (in Miller, 1900, p. 244; cf. Kloss, 1903b, p. 68). FAS; B:SCS-27.

Airfield building, 0.5 km N, 4 km E, 80 m; *Con Son,* VIETNAM; 8°44′N, 106°40′E; collected 5 Mar. 1968 by M. L. Cunningham (see Duncan et al., 1970, p. 180); USNM, 1 (skull only). CON; A:V-7.

Airfield building, 2.5 km E, 0.7 km N, [0–590 m]; *Con Son,* VIETNAM; 8°44′N, 106°37′E; collected 28 Feb. 1968 by J. F. Duncan (see Van Peenen et al., 1969, pp. 100, 285; 1970, p. 421); USNM, 1. CON; A:V-7.

Airfield building, 3.3 km E, 0.6 km N, ca. 160 m; *Con Son,* VIETNAM; 8°44′N, 106°37′E; collected 12 Mar. 1968 by M. L. Cunningham (see Van Peenen et al., 1969, p. 100, 285; 1970, p. 421); USNM, 1. CON; A:V-7.

Ajer Dingin; *Pulau Simeulue,* INDONESIA; 2°29′N, 96°23′E; collected 10 Mar. 1913 by E. Jacobson (1917, p. 276); BM(NH), 2 (including 1 skin only). FUS; B:IO-3.

Akyab harbor. See *Myengun Kyun.*

Alas, Lae, between Agusan and Ketambe Research Station; *Sumatra,* INDONESIA; ca. 3°48′N, 97°33′E; observed Oct. 1984 by M. P. Ghiglieri (1986, p. 106). FAS; B:S-13.

Alas, Lae, between Bengkong River and Gelombang; *Sumatra,* INDONESIA; ca. 2°53′N,

97°53′E; observed Oct. 1984 by M. P. Ghiglieri (1986, p. 108). FAS; B:S-15.

Alas, Lae, between Gelombang and mouth of river; *Sumatra,* INDONESIA; 2°32′N, 97°49′E; observed Oct. 1984 by M. P. Ghiglieri (1986, p. 108). FAS; B:S-16.

Alas, Lae, between Lae Renun and Bengkong River; *Sumatra,* INDONESIA; ca. 3°02′N, 97°55′E; observed Oct. 1984 by M. P. Ghiglieri (1986, p. 108). FAS; B:S-15.

Alas, Lae, between Muara Setulen and Lae Renun; *Sumatra,* INDONESIA; ca. 3°10′N, 97°55′E; observed Oct. 1984 by M. P. Ghiglieri (1986, p. 106). FAS; B:S-15.

Alas Kedaton. See Kukuh.

Alas River. See Alas, Lae.

Alor, Pulau, Lesser Sunda Islands, INDONESIA; 8°08′–8°28′S, 124°20′–125°08′E; *M. fascicularis* reported absent before 1937 by J. J. M. F. Symons (Mertens, 1936, p. 319). C:h.

Amarassie; *Pulau Timor,* Lesser Sunda Islands, INDONESIA; 10°20′S, 123°40′E; collected Jun. 1829 by S. Müller and H. C. Macklot; RMNH, 1 (skin only, skull inside). FAS; C:LS-25.

Ambawang, Sungai, near Pontianak; *Borneo: Kalimantan,* INDONESIA; 0°02′S, 109°42′E; collected 18 Jun. 1905 by W. L. Abbott (field catalog; in Lyon, 1907, p. 548); USNM, 1. FAS; C:K-2.

Ampang area; *Pulau Sumbawa,* Lesser Sunda Islands, INDONESIA; ca. 8°47′S, 118°00′E; blood samples taken Jan. 1979–Dec. 1981 by Y. Kawamoto (1982, p. 67). FAS; C:LS-10.

Amphoe Fhang. See Ban Na.

Anak Krakatau, Pulau, INDONESIA; 6°06′S, 105°25′E; primates reported absent 1928–1934 by K. W. Dammerman (1948, p. 61); island emerged in 1928. B:k.

Anamba. See *Siantan, Pulau.*

Angaur Island, MICRONESIA; 6°53′–6°55′N, 134°08′–134°09′E; introduced population, observed Jun.–Aug. 1973 by F. E. Poirier and E. O. Smith (1974, p. 258). Blood samples taken Nov.–Dec. 1986 by Y. Kawamoto, K. Nozawa, K. Matsubayashi, and S. Gotoh (1988, p. 170). Subspecies uncertain; not mapped.

Arakan Division; BURMA; 17°22′–21°33′N, 92°10′–94°54′E; collected in 1871 by museum collector; ZSI, 1 (skin only, skull inside). Two skulls (21D, 21E) presented in 1843 by A. P. Phayre (see J. Anderson, 1881, p. 63) are not now in the ZSI collection. AUR; A:Bu-3.

Aranyaprathet; THAILAND; 13°41′N, 102°30′E; collected 6 May 1937 by J. A. Griswold, Jr. (see Allen & Coolidge, 1940, p. 147); MCZ, 1. FAS; A:T-11.

Arranya. See Aranyaprathet.

Ataran. See Ye Forest, Ataran district, Moulmein region.

Ataran River, between Podowk and Kya-eng; BURMA; ca. 16°02′N, 98°00′E; observed 3 Feb. 1859 by S. R. Tickell (1859, p. 426). AUR; A:Bu-11.

Atjeh. See Lesten, Daerah Istimewa Aceh.

Aur, Pulau, MALAYSIA: WEST MALAYSIA; 2°26′–2°28′N, 104°30′–104°33′E; collected 14 Jun. 1912 by H. C. Robinson; BM(NH), 1. Collected 1–8 May 1927 by N. Smedley; ZRC, 2 (1 skin only). FAS; B:SCS-5.

Babi, Pulau, INDONESIA; 2°03′–2°07′N, 96°37′–96°42′E; primates reported absent 7–14 Jan. 1902 by W. L. Abbott (see Miller, 1903a, p. 479). B:d.

Badang, 400–600 m; *Borneo: Kalimantan,* INDONESIA; 2°45′N, 115°43′E; collected 21 May–11 Jun. 1935 by V. von Plessen (see Stresemann, 1938, p. 109); AMNH, 5; MZB, 1. FAS; C:K-35.

Bahau, Sungai. See Badang.

Bako National Park; *Borneo,* MALAYSIA: SARAWAK; ca. 1°40′N, 110°26′E; reported present in 1971 by G. Rothchild (1971, p. 169). Observed Sep.–Dec. 1980 by R. E. Salter and K. M. Aken (1983, p. 8). FAS; C:Sar-4.

Bakong. See *Bakung, Pulau.*

Bakung, Pulau, INDONESIA; 0°01′–0°10′N, 104°23′–104°30′E; reported present 15–22 Jul. 1903 by W. L. Abbott (see Miller, 1906c, p. 283). FAS; B:SCS-12.

Balambangan, Pulau, MALAYSIA: SABAH; 7°10′–7°21′N, 116°51′–117°01′E; observed Feb.–Jun. 1991 by Shukor Md. Nor (pers. comm., 20 Jul. 1991). FAS; C:Sab-8.

Balbalan; *Sumatra,* INDONESIA; not located, 5°38′N–5°57′S, 95°12′–106°05′E; collected 4 Jul. 1904 by W. Volz; ZMB, 1 (skull only). FAS; not mapped.

Bali, Pulau, Lesser Sunda Islands, INDONESIA; 8°04′–8°48′S, 114°26′–115°42′E; reported present ca. May 1845 by H. Zollinger (1845, p. 46). FAS; C:LS-1 through LS-3.

Bali Barat National Park; *Pulau Bali,* Lesser Sunda Islands, INDONESIA; ca. 8°08′S, 114°30′E; reported in 1982 by A. H. Robinson and Y. Rustandi (1982, p. 14). Observed May–Jun. 1990 by A. Fuentes (in Wheatley et al., 1993, p. 1). FAS; C:LS-1.

Balipor. See Pajo, Danau Singkarak, Balipor district.

Baluran Game Reserve; *Java,* INDONESIA; ca. 7°51′S, 114°22′E; observed Sep. 1969–Jan. 1971 by W. Angst (1975, p. 326). FAS; C:J-41.

Banda Aceh, ca. 20 km SSW; *Sumatra,* INDONESIA; ca. 5°27′N, 95°16′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-5.

Banda Aceh, ca. 30 km ENE; *Sumatra,* INDONESIA; ca. 5°36′N, 95°35′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-6.

Banda Aceh, ca. 40 km S; *Sumatra,* INDONESIA; ca. 5°10′N, 95°19′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-4.

Banda Aceh, ca. 45 km S; *Sumatra,* INDONESIA; ca. 5°07′N, 95°18′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-4.

Banda Aceh, ca. 85 km ESE; *Sumatra,* INDONESIA; ca. 5°17′N, 96°02′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-7.

Banda Aceh, near; *Sumatra,* INDONESIA; ca. 5°34′N, 95°20′E; blood samples taken Nov.–Dec. 1986 by J. R. de Ruiter (1993, p. 91). FAS; B:S-5.

Bandar Seri Begawan, near; *Borneo,* BRUNEI; ca. 4°53′N, 114°56′E; observed ca. 1980 by R. A. Mittermeier (1980, p. 252). FAS; C:B-1.

Bandjar. See Tjeringin, near Banjar, Preanger region, east.

Bandung; *Java,* INDONESIA; 6°54′S, 107°36′E; collected 29 Apr. 1938 by N. Gosselaar; RMNH, 1 (skull only). FAS; B:J-7.

Bandung, 2000 ft (= 600 m); *Java,* INDONESIA; ca. 6°54′S, 107°36′E; collected in 1936 by D. P. Bosscha Erdbrink; ZLUU, 1 (skull only); FAS; B:J-7.

Bandung, near, 700 m; *Java,* INDONESIA; "6°54′S, 107°37′E"; collected 7 Oct. 1971 by NAMRU Djakarta Detachment; USNM, 1. FAS; B:J-7.

Banggi, Pulau, south, MALAYSIA: SABAH; ca. 7°06′N, 117°04′E; collected 4–5 Sep. 1927 by F. N. Chasen and C. B. Kloss (1931, p. 1); ZRC, 3. FAS; C:Sab-9.

Bangka, Pulau, INDONESIA; 1°30′–3°07′S, 105°06′–106°51′E; reported present before 1852 by P. Bleeker (1851, p. 527). Collected in 1898 by Blonk; ZSBS, 1 (skull only). Collected in 1900 by A. A. W. Hubrecht (see Kohlbrugge, 1902, p. 322); ZLUU, 170 (including 158 skulls only, 12 mandibles only). Collected ca. 1936 by H. J. V. Sody (1937, p. 248); RMNH, 3 (including 1 skull only). Reported present Nov. 1971–Jan. 1973 by C. L. Darsono (Crockett & Wilson, 1980, p. 156). FAS; B:SCS-18, SCS-19.

Bangkaru, Pulau, Kepulauan Banyak, INDONESIA; 2°00′–2°07′N, 97°04′–97°09′E; monkeys reported absent 16–21 Jan. 1902 by W. L. Abbott (see Miller, 1903a, p. 479). B:e.

Bangko, ca. 15 km ENE; *Sumatra,* INDONESIA; ca. 1°49′N, 100°55′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-37.

Bangko, ca. 20 km ENE; *Sumatra,* INDONESIA; ca. 1°49′N, 100°58′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-37.

Bangko, ca. 20 km N; *Sumatra,* INDONESIA; ca. 1°55′N, 100°51′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-37.

Bangko, ca. 25 km ENE; *Sumatra,* INDONESIA; ca. 1°41′N, 101°02′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-37.

Bangko, ca. 30 km NNW; *Sumatra,* INDONESIA; ca. 2°03′N, 100°46′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-37.

Bangko, ca. 80 km S; *Sumatra,* INDONESIA; ca. 1°00′N, 100°49′E; reported Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). FAS; B:S-39.

Bangko, ca. 90 km SSE; *Sumatra,* INDONESIA; ca. 1°00′N, 101°05′E; reported Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). FAS; B:S-40.

Bangkok; THAILAND; 13°45′N, 100°31′E; collected in 1869 by M. Boucourt; MNHN, 1 (skin only, skull inside). FAS; A:T-30.

Bangli, near; *Pulau Bali,* Lesser Sunda Islands, INDONESIA; ca. 8°27′S, 115°21′E; observed ca. 1993 by B. P. Wheatley, A. Fuentes, and D. K. Harya Putra (1993, p. 1). FAS; C:LS-3.

Banguey Island. See *Banggi, Pulau,* south.

Ban Huai Maenam Noi, ca. 15 km SE, ca. 75 m; THAILAND; 14°25′N, 98°51′E; collected 16–17 Feb. 1967 by J. Fooden (1971, p. 16); FMNH, 2. FAS; A:T-26.

Banjak Islands. See *Tuangku, Pulau* and *Bangkaru, Pulau,* Kepulauan Banyak.

Banjar. See Tjeringin, near Banjar, Preanger region, east.

Banjoewangi. See Banyuwangi.

Banjoe Wetan (? = Banyuwedang), sea level; *Pulau*

Bali, Lesser Sunda Islands, INDONESIA; ?8°08′S, 114°36′E; collected 18 Jul. 1933 by J. J. Menden; MZB, 3. FAS; C:LS-1.

Banka. See *Bangka, Pulau.*

Bankachon. See Pakchan River, near Bankachon.

Ban Kosum; THAILAND; 15°50′N, 104°00′E; reported present before 1978 by B. Lekagul and J. A. McNeely (1977, pp. 293, 725). Subspecies uncertain; A:T-14.

Ban Mae Na Ree, ca. 200 m; THAILAND; 16°25′N, 99°23′E; collected 13 Mar. 1967 by J. Fooden (1971, p. 18); FMNH, 3. AUR/FAS/MUL; A:T-2.

Ban Me Thuot. See Lac Giao.

Ban Na; THAILAND; ca. 8°10′N, 100°10′E; collected 11 Feb. 1954 by B. Lekagul; USNM, 1. AUR/FAS/MUL; A:T-64.

Ban Nam Lai Tai, ca. 5 km W, ca. 300 m; THAILAND; 16°10′N, 99°20′E; collected 4–5 Apr. 1967 by J. Fooden (1971, p. 19); CTNRC, 1; FMNH, 7 (including 1 infant in fluid). AUR/FAS/MUL; A:T-1.

Ban Nong Kok; THAILAND; 8°06′N, 98°52′E; collected 11 Jan, 1918 by local collectors employed by H. C. Robinson and C. B. Kloss (1919, p.87); ZRC, 1. FAS; A:T-60.

Ban Nong Put, ca. 75 m; THAILAND; 8°11′N, 98°53′E; collected 5 Jun. 1973 by J. Fooden ([1975], p. 98); CTNRC, 1. FAS; A:T-60.

Ban Pak Nam. See Chumphon, Khlong, mouth.

Ban Pak Nam Pho, ?150 m; THAILAND; 15°43′N, 100°09′E; collected 2 Apr. 1924 by J. H. Chambrai [and K. G. Gairdner] (see Kloss, 1919a, p. 49; 1930, p. 61); ZRC, 1. Collected 29–30 Aug. 1926 by C. J. Aagaard; MCZ, 2. FAS; A:T-5.

Ban Palian. See Khao Rang Kai.

Ban Phra Muang; THAILAND; 7°18′N, 99°28′E; collected 7 Mar. 1896 by W. L. Abbott (see Riley, 1938, p. 12); USNM, 2. FAS; A:T-56.

Ban Phu Toie, 100–200 m; THAILAND; 14°42′N, 99°07′E; collected 31 Jan. 1967 by J. Fooden (1971, p. 14); FMNH, 2. FAS; A:T-21.

Ban Sadein; BURMA; 10°20′N, 98°32′E; collected 18 Feb. 1928 by Faunthorpe-Vernay Expedition; AMNH, 1. AUR; A:Bu-22.

Ban Sai Kau, Nong Chik region; THAILAND; 6°38′N, 101°08′E; captives obtained 17 Jun. 1902 by N. Annandale and H. C. Robinson (1903, p. xxxvii; cf. Bonhote, 1903, p. 3); BM(NH), 1. FAS; A:T-69.

Ban Sakaerat; THAILAND; 14°30′N, 101°56′E; collected 8 Jan. 1912 by N. Gyldenstolpe (1913, p. 3; 1914, p. 1; cf. Thonglongya, 1967, p. 187); NHRM, 1 (skull only). FAS; A:T-10.

Banta, Pulau, Lesser Sunda Islands, INDONESIA; 8°24′–8°29′S, 119°16′–119°18′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:d.

Bantam region. See Camara; Cihara; Cikujang; Pelabuhanratu, Teluk; and Tamandjaija.

Ban Tamrong Phato, ca. 100 m; THAILAND; 14°54′N, 98°31′E; collected 10–11 Feb. 1967 by J. Fooden (1971, p. 15); CTNRC, 1; FMNH, 7. AUR; A:T-20.

Bantargebang; *Java,* INDONESIA; 7°01′S, 106°40′E; collected 21–23 Oct. 1909 by O. Bryant and W. Palmer; MCZ, 2 (including 1 skin only); USNM, 3. FAS; B:J-9.

Banten area. See Danau, Rawa.

Ban Thap Plik. See Ban Nong Put; Tham Hom, 4 km W of Ban Thap Plik.

Ban Thap Plik, 1 km NE, ca. 75 m; THAILAND; 8°11′N, 98°53′E; collected 4–5 Jun. 1973 by J. Fooden ([1975], p. 98); FMNH, 3 (including 1 infant in fluid). FAS; A:T-60.

Ban Wan; THAILAND; 15°23′N, 104°11′E; observed 12–14 Jul. 1989 by N. Aggimarangsee (1992, pp. 109, 120; pers. comm., Oct. 1993). Subspecies uncertain; A:T-17.

Ban Wang Kalang. See Khwae Noi, Mae Nam.

Ban Wang Phato. See Ban Tamrong Phato.

Banyuwangi; *Java,* INDONESIA; 8°12′S, 114°21′E; collected 16 Dec. 1919 by unknown collector; RMNH, 1. FAS; C:J-42.

Baram, Batang; *Borneo,* MALAYSIA: SARAWAK; 4°35′N, 114°00′E; collected 1884–1898 by C. Hose and E. Hose (see Medway, 1977, pp. 3–4); ANSP, 1 (skull only); BM(NH), 2 (including 1 skull only); NMS, 1 (skin only); SMK, 1 (skin only, skull inside); USNM, 1. Collected Jul. 1896 by W. H. Furness III (1896, p. 310) and H. M. Hiller; ANSP, 1 (skull only). FAS; C:Sar-18.

Baram district; *Borneo,* MALAYSIA: SARAWAK; ca. 4°35′N, 113°58′E; collected date unknown by unknown collector; University Museum of Zoology, Cambridge, 1 (skeleton only; not seen, data from P. H. Napier, 1981, p. 14). FAS; C:Sar-18.

Baramfluss. See Baram, Batang.

Bari; *Pulau Flores,* Lesser Sunda Islands, INDONESIA; 8°21′S, 120°11′E; collected 21 Nov. 1888–9 Jan. 1889 by M. Weber (1890a, p. viii; 1890b, p. 102); museum unknown, 1 (skull only, not seen). FAS; C:LS-16.

Barisan Selatan; *Sumatra,* INDONESIA; ca. 3°00′S, 102°15′E; observed in 1983 by K. S. MacKinnon (1986, p. 112). Observed Jun. 1988 by M. Bismark (1992, p. 11). FAS; B:S-66.

Barito, Sungai. See Purukcahu, Sungai Barito.

Barito, Sungai, right bank, above Banjarmasin; *Borneo: Kalimantan,* INDONESIA; ca. 3°13′S, 114°32′E; observed Jul. 1984–May 1986 by K. M. Burton (see Chivers & Burton, [1991], p. 140). FAS; C:K-25.

Barren Island, Andaman Islands, INDIA; 12°15′–12°17′N, 93°50′–93°52′E; primates reported absent before 1903 by G. S. Miller, Jr. (1902, p. 792; cf. Kloss, [1928], p. 802; Chaturvedi, 1980, p. 134). A:d.

Batam, Pulau, Kepulauan Riau, INDONESIA; 0°58′–1°12′N, 103°54′–104°10′E; reported present 15–17 Sep. 1905 by W. L. Abbott (see Miller, 1906c, p. 282). FAS; B:SCS-10.

Batang Garut; *Sumatra,* INDONESIA; 2°23′N, 99°38′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-31.

Batangkuis; *Sumatra,* INDONESIA; 3°40′N, 98°44′E; collected 1906–1910 by C. Bruegel; ZSBS, 13 (including 10 skins only, 2 skulls only). FAS; B:S-21.

Batoe-meringgit; *Pulau Bali,* Lesser Sunda Islands, INDONESIA; not located, 8°04′–8°55′S, 114°26′–115°43′E; collected 8 Oct. 1928 by P. F. Franck; MZB, 1. FAS; not mapped.

Battam. See *Batam, Pulau.*

Batu, Tanjung; *Pulau Belitung,* INDONESIA; ca. 2°56′S, 107°32′E; collected 19–20 Jul. 1904 by W. L. Abbott (in Lyon, 1906, p. 608); USNM, 2. FAS; B:SCS-20.

Batu Apoi Forest Reserve. See Kuala Belalong Field Studies Centre.

Batu Bara district; *Sumatra,* INDONESIA; ca. 3°00′N, 99°15′E; collected 1897–1899 by G. Schneider (1905, p. 72); museum and number of specimens unknown (not seen). FAS; B:S-23.

Batudulang, 800–900 m; *Pulau Sumbawa,* Lesser Sunda Islands, INDONESIA; 8°36′S, 117°19′E; collected 5–8 May 1927 by Sunda-Expedition Rensch (see B. Rensch, 1930, p. 79; Mertens, 1930, p. 133; I. Rensch, 1934, p. 226); MZB, 2; NMS, 1 (skin only); ZMB, 2. FAS; C:LS-8.

Batu Islands. See *Tanahbala, Pulau*; *Tanahmasa, Pulau.*

Batur, Gunung, inside cone; *Pulau Bali,* Lesser Sunda Islands, INDONESIA; 8°14′S, 115°23′E; unconfirmed report ca. 1993 by unspecified informant (Wheatley et al., 1993, p. 1). FAS; C:LS-3.

Baturaden, Gunung Slamet, 700 m; *Java,* INDONESIA; ca. 7°19′S, 109°14′E; collected 9 Oct. 1929 by H. J. V. Sody; RMNH, 1. FAS; B:J-24.

Baturaja, ca. 20 km NNE; *Sumatra,* INDONESIA; ca. 4°00′S, 104°17′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-74.

Baturaja, ca. 30 km NNE; *Sumatra,* INDONESIA; ca. 3°56′S, 104°20′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-74.

Baturaja, ca. 70 km WNW; *Sumatra,* INDONESIA; ca. 3°47′S, 103°39′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p.156). FAS; B:S-73.

Baturaja, ca. 75 km NW; *Sumatra,* INDONESIA; ca. 3°42′S, 103°42′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-73.

Bawean, Pulau, INDONESIA; 5°43′–5°53′S, 112°33′–112°44′E; collected 24 Nov. 1907 by W. L. Abbott (in Lyon, 1911, p. 61); USNM, 3. Collected 6–12 May 1928 by Denin and P. F. Franck; MZB, 6. FAS; C:J-38.

Belaga; *Borneo,* MALAYSIA: SARAWAK; 2°42′N, 113°37′E; collected Oct.–Nov. 1932 by Oxford University Expedition to Borneo (see Harrisson, 1933, p. 402; P. H. Napier, 1981, p. 14); BM(NH), undetermined portion of 6 specimens (including 1 skin only and 3 skulls only) collected at Belaga and/or Kalulong (C:Sar-20). FAS; C:Sar-12.

Belawan; *Sumatra,* INDONESIA; 3°47′N, 98°41′E; blood samples taken Jan. 1979–Dec. 1981 by Y. Kawamoto (1982, p. 67). FAS; B:S-21.

Belitung, Pulau, INDONESIA; 2°32′–3°16′S, 107°32′–108°17′E; reported present before 1906 by T. Willink (1905, p. 175). FAS; B:SCS-20.

Ben Dam, 1.2 km W, 0.1 km S; *Hon Ba,* VIETNAM; 8°39′N, 106°33′E; collected 2 Mar. 1968 by J. F. Duncan (in Van Peenen et al., 1970, p. 421); USNM, 1. CON; A:V-7.

Ben Dam, 1.7 km W, ca. 20 m; *Hon Ba,* VIETNAM; 8°39′N, 106°33′E; collected 2 Mar. 1968 by P. F. D. Van Peenen (in Van Peenen et al., 1970, p. 421); USNM, 2 (including 1 skull only). CON; A:V-7.

Ben Dam, 3.1 km W, 0.6 km S, 100 m; *Hon Ba,* VIETNAM; 8°39′N, 106°33′E; collected 2 Mar. 1968 by M. L. Cunningham (see Van Peenen et al., 1970, p. 421); USNM, 1. CON; A:V-7.

"Bengale"; country unknown; acquired by L. T. Leschenault de la Tour (1820, p. 359; 1822, p. 262), probably in Calcutta, Sep. 1819–Jan. 1820; MNHN, 1 (skin only). Captive acquired 5–27 Apr. 1837 at Diamond's Harbor, near Calcutta, by J. F. T. Eydoux and L. Souleyet (1841, p. xiv, 6); MNHN, 1 (skin only). AUR; not mapped.

"Bengalen"; country unknown; acquired in 1852 by E. Rüppell; NMS, 1 (skull only). Collected date unknown by Frank; ZMB, 1 (skull only). Subspecies uncertain; not mapped.

Bengkalis, Pulau, INDONESIA; 1°15′–1°37′N, 101°59′–102°31′E; reported present 24 Feb.–3 Apr. 1906 by W. L. Abbott (in Lyon, 1908, p. 624). FAS; B:SM-6.

Bengkulu; *Sumatra,* INDONESIA; 3°48′S, 102°16′E; colelcted 1887–1941 by E. Dubois; RMNH, 1 (skull only). FAS; B:S-69.

Bengkulu, ca. 40 km ENE; *Sumatra,* INDONESIA; ca. 3°38′S, 102°35′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-70.

Bengkulu, Propinsi (province); *Sumatra,* INDONESIA; 2°23′–5°00′S, 101°06′–103°50′E; blood samples taken Jan.–Nov. 1979 by Y. Kawamoto and Tb. M. Ischak (1981, p. 238). FAS; not mapped.

Benom, Gunong; MALAYSIA: WEST MALAYSIA; ca. 3°50′N, 102°06′E; collected 8 Nov. 1913 by museum collector (see H. C. Robinson & Kloss, 1915b, p. 174); ZRC, 2. FAS; B:WM-15.

Benom, Gunong, 4000 ft (= 1220 m); MALAYSIA: WEST MALAYSIA; ca. 3°50′N, 102°06′E; observed 1968–1972 by unspecified informant (Medway, 1972b, p. 120). FAS; B:WM-15.

Benom, Gunong, NE slope, 700 ft (= 210 m); MALAYSIA: WEST MALAYSIA; 3°52′N, 102°11′E; collected 1 Feb.–15 Apr. 1967 by Lord Medway (1972a, p. 5; 1972b, p. 120; cf. Whitmore, 1972, p. 12); BM(NH), 1 (skeleton only). FAS; B:WM-15.

Benu, *Pulau Timor,* Lesser Sunda Islands, INDONESIA; 9°56′S, 123°59′E; observed 24 Apr. 1930 by Jhr. W. C. van Heurn (1932, p. 65). FAS; C:LS-26.

Benua, Pulau, INDONESIA; 0°55′–0°58′N, 107°25′–107°28′E; collected 6 Aug. 1899 by W. L. Abbott (in Miller, 1900, p. 243; cf. Kloss, 1903b, p. 61; Oberholser, 1919, p. 129); USNM, 2. FAS; B:SCS-26.

Berangkat, Gunong, east; MALAYSIA: WEST MALAYSIA; ca. 5°10′N, 102°06′E; reported present in 1968 by D. Chivers (1971, p. 80). FAS; B:WM-9.

Berapit, Bukit, east; MALAYSIA: WEST MALAYSIA; ca. 4°05′N, 103°20′E; reported present in 1968 by D. Chivers (1971, p. 80). FAS; B:WM-13.

Berau, Sungai, north bank; *Borneo: Kalimantan,* INDONESIA; 2°09′N, 117°29′E; collected 29 Jul. 1912 by H. C. Raven (see Deignan, [1960], p. 267); USNM, 6 (external measurements recorded in field catalog). FAS; C:K-42.

Berhala, Pulau, INDONESIA; 3°46′N, 99°31′E; primates reported absent in 1953 by J. L. Harrison and J. R. Hendrickson (1963, p. 548). B:a.

Betotan, ca. 22 mi (= 35 km) SW of Sandakan, 31 m; *Borneo,* MALAYSIA: SABAH; 5°48′N, 117°50′E; collected 13 Aug. 1927 by F. N. Chasen and C. B. Kloss (1931, p. 1; cf. Davis, 1962, p. 126; Weitzel et al., 1988, p. 133); ZRC, 1. FAS; C:Sab-16.

Bettotan. See Betotan.

Big Kretam River. See Kretam Besar, Sungai.

Big Tambelan Island. See *Tambelan Besar, Pulau.*

Bilasodia, Naf River; BANGLADESH; ca. 21°05′N, 92°12′E; observed Sep. 1982–Feb. 1983 by M. A. R. Khan and M. A. Wahab (1983, p. 104; cf. M. A. R. Khan, 1981, p. 13; 1985, p. 30). AUR; A:Ba-1.

Billiton. See *Belitung, Pulau* and Batu, Tanjung; *Pulau Belitung.*

Bima. See Kambing, Pulau.

Bimirdia, Naf River; BANGLADESH; ca. 21°05′N, 92°12′E; observed Sep. 1982–Feb. 1983 by M. A. R. Khan and M. A. Wahab (1983, p. 104; cf. M. A. R. Khan, 1981, p. 13; 1985, p. 30). AUR; A:Ba-1.

Binjai, Sungai; *Pulau Natuna Besar,* INDONESIA; 3°47′N, 108°14′E; collected 27 Aug. and 5 Sep. 1928 by F. N. Chasen (1935a, p. 5); ZRC, 2. FAS; B:SCS-33.

Bintan, Pulau, Kepulauan Riau, INDONESIA; 0°48′–1°13′N, 104°13′–104°34′E; collected 11 Jun. 1930 by G. Nunong; ZRC, 2. FAS; B:SCS-8.

Bintan, Pulau, north coast, Kepulauan Riau, INDONESIA; ca. 1°10′N, 104°30′E; collected 12 Aug. 1902 by W. L. Abbott (field catalog; cf. Miller, 1906c, p. 282); USNM, 1. FAS; B:SCS-8.

Bintang, Pulau. See *Bintan, Pulau.*

Birang, Sungai; *Borneo: Kalimantan,* INDONESIA; 2°11′N, 117°27′E; collected 3 Oct. 1912 by H. C. Raven (see Deignan, [1960], p. 268); USNM, 1 (skin, skinned head in fluid; external measurements recorded in field catalog). FAS; C:K-42.

Biserat. See Kampong Biserat.

Blambangan-Purwo Nature Park. See South Banyuwangi Nature Park.

Bliah. See Selatbliat.

Bodo, Gili. See *Sababi, Pulau.*

Boegies. See *Bugis, Gili.*

Boekit Sanggul (Benkoelan). See Sanggul, Bukit, Propinsi Bengkulu.

Boeloengan. See Badang; Long Peleben; Sembakung, Sungai.

Bogor; *Java,* INDONESIA; 6°35′S, 106°47′E; collected 23 Sep. 1928 by G. Schiffer; MZB, 1. FAS; B:J-17.

Bohorok district. See Bungara; Bukitlawang.

Bokong, 180 m; *Pulau Timor,* Lesser Sunda Islands, INDONESIA; 9°58′S, 124°04′E; collected 24–26 Jul. 1911 by C. B. Haniel (see Hellmayr, 1914, p. 5); ZSBS, 2 (including 1 skin only, 1 skull only). FAS; C:LS-26.

Bolongs, Outer. See *Myengun Kyun.*

Bolovens, Plateau des. See Thateng, Muang, Plateau des Bolovens.

Bongao Peak, 70–300 m; *Bongao Island,* Tawitawi Prov., PHILIPPINES; 5°01′N, 119°45′E; 4 troops observed 24–26 Jan. 1990 by R. P. Rubio, P. L. Alviola III, and M. R. Felizardo (1990, p. 29). FAS; C: not numbered (new record, not in Fooden, 1991, p. 2).

Bongkabong. See Rugading, near Bongkabong.

Bongkabong, near sea level; *Borneo,* MALAYSIA: SABAH; ca. 5°59′N, 116°04′E; collected 21 Aug. 1937 by J. A. Griswold, Jr. (see Coolidge, 1940, p. 123); MCZ, 3. FAS; C:Sab-4.

Borneo: Kalimantan, INDONESIA; 4°25′N–4°10′S, 108°50′–119°00′E; collected in 1851 by J. H. Croockewit (see Medway, 1977, p. 3); RMNH, 1 (skin only, skull inside). Collected before 1857 by Verreaux; BM(NH), 1. Collected ca. 1897 by A. Harrison, Jr., and H. M. Hiller; ANSP, 1. Collected 24 Apr. 1902 by Dr. Pagel; ZMB, 1 (skin only). Collected 1907–1910 by C. Bruegel; ZSBS, 67 (including 60 skins only). Collected date unknown by C. Bruegel; ZSBS, 13 (including 4 skins only, 9 skulls only). Collected before 1948 by unknown collector; RCS(OM), 1 (skull only). Collected 8 Nov. 1961–6 Apr. 1962 by R. E. Kuntz; USNM, 4. Collected date unknown by unknown collector; AMNH, 1 (skull only; female skull mismatched with male skin). FAS; not mapped.

Borneo: Kalimantan, southeast, INDONESIA; 4°25′N–4°10′S, 108°50′–119°00′E; collected in 1851 by J. H. Croockewit (see Medway, 1977, p. 3); RMNH, 1 (skull only). Collected date unknown by unknown collector; ZMB, 1 (skull only). FAS; not mapped.

Borneo: Kalimantan, southwest, INDONESIA; 4°25′N–4°10′S, 108°50′–119°00′E; collected in 1836 by S. Müller (see Medway, 1977, p. 3); RMNH, 3 (skins only, skulls inside). FAS; not mapped.

Botanical Gardens, near Danau Buyan and Danau Bratan; *Pulau Bali,* Lesser Sunda Islands, INDONESIA; ca. 8°15′S, 115°09′E; observed ca. 1993 by B. P. Wheatley, A. Fuentes, and D. K. Harya Putra (1993, p. 1). FAS; C:LS-3.

"Brandan?"; *Sumatra,* INDONESIA; not located, 5°38′N–5°57′S, 95°12′–106°05′E; collected date unknown by W. Volz; ZMB, 1 (skin only). FAS; not mapped.

Bratan, Danau, ca. 2500 ft (= 750 m); *Pulau Bali,* Lesser Sunda Islands, INDONESIA; 8°16′S, 115°11′E; collected Jan. 1911 by E. Stresemann; BM(NH), 1 (skin only). Collected date unknown by unknown collector; BM(NH), 1 (skull only; possibly skull of preceding). FAS; C:LS-3.

Bratan, [Gunung], 1200 m; *Pulau Bali*; Lesser Sunda Islands, INDONESIA; 8°15′S, 115°12′E; collected 3–8 Feb. 1938 by V. von Plessen; AMNH, 3. FAS; C:LS-3.

Brunei Bay area; *Borneo,* BRUNEI; ca. 4°50′N, 115°05′E; observed Nov. 1962–Mar. 1963 by J. A. Kern (1964, p. 185). FAS; C:B-1.

Btg. Kwis. See Batangkuis.

Bugis, Gili, Lesser Sunda Islands, INDONESIA; 8°30′S, 119°35′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:d.

Buitenzorg. See Bogor.

Bukar, Sungai; *Borneo,* MALAYSIA: SARAWAK; ca. 1°16′N, 110°28′E; collected 2 Nov. 1919 by C. Ulok; ZRC, 1. FAS; C:Sar-5.

Bukit Barisan Selatan, Taman Nasional, Lampung; *Sumatra,* INDONESIA; ca. 5°15′S, 104°15′E; observed Jun. 1988 by M. Bismark (1992, pp. 11, 13). FAS; B:S-78.

Bukit Cangang; *Sumatra,* INDONESIA; ca. 0°10′S, 100°05′E; observed 8 Sep. and 20–23 Oct. 1980 by N. Koyama, A. Asuan, and N. Natsir (1981, p. 1). Blood samples taken Jul.–Oct. 1980 by Y. Kawamoto, K. Nozawa, and Tb. M. Ischak (1981, p. 16). FAS; B:S-44.

Bukit Cheraka. See Cherakah, Bukit.

Bukit Garam; *Borneo,* MALAYSIA: SABAH; ca. 5°28′N, 117°52′E; observed 25 May–23 Jul. 1963 by K. Yoshiba (1964, p. 25). FAS; C:Sab-14.

Bukitlawang; *Sumatra,* INDONESIA; ca. 3°30′N, 98°06′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-20.

Bukitlawang, Area I, Bohorok district; *Sumatra,* INDONESIA; ca. 3°34′N, 98°07′E; 2 troops observed 11 Nov. 1980–18 Apr. 1982 by K. J. Gurmaya (1989, p. 66). FAS; B:S-20.

Bukitlawang, Area II, Bohorok district; *Sumatra,*

INDONESIA; ca. 3°33′N, 98°07′E; observed 11 Nov. 1980–18 Apr. 1982 by K. J. Gurmaya (1989, p. 66). FAS; B:S-20.

Bukitlawang, ca. 35 km SW; *Sumatra,* INDONESIA; ca. 3°15′N, 97°55′E; reported before 1981 by M. Borner (Crockett & Wilson, 1980, p. 156). FAS; B:S-15.

Bukitlawang, ca. 65 km S; *Sumatra,* INDONESIA; ca. 2°55′N, 98°07′E; reported Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). FAS; B:S-25.

Bukit Timah Nature Reserve; *Singapore Island*; SINGAPORE; ca. 1°21′N, 103°48′E; observed before 1901 by S. S. Flower (1900, p. 316). Reported present in 1941 (Burkhill, 1961, p. 162). Observed 25 Jul. 1986–6 Nov. 1987 by P. W. Lucas (Lucas & Corlett, 1991, p. 202). FAS; B:SCS-7.

Bukittinggi; *Sumatra,* INDONESIA; 0°19′S, 100°22′E; collected date unknown by unknown collector; ZMB, 1 (skull only). FAS; B:S-45.

Bukittinggi, ca. 20 km S; *Sumatra,* INDONESIA; ca. 0°23′S, 100°25′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-45.

Bukittinggi vicinity; *Sumatra,* INDONESIA; ca. 0°19′S, 100°22′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-45.

Bulan, Pulau, Kepulauan Riau, INDONESIA; 0°55′–1°02′N, 103°51′–103°58′E; collected 5–10 Apr. 1924 by F. N. Chasen (1924b, p. 59); ZRC, 2. FAS; B:SCS-15.

Bulan, Pulau, [south], Kepulauan Riau; INDONESIA; ca. 0°57′N, 103°56′E; collected 22 Mar. 1907 by W. L. Abbott (field catalog; cf. Lyon, 1909, p. 479); USNM, 1. FAS; B:SCS-15.

Bulang, Pulau. See *Bulan, Pulau.*

Boloh. See Kampong Sungai Buloh.

Bundu Tuhan. See Kampong Bundu Tuhan.

Bunga Buah, 1000 m; MALAYSIA: WEST MALAYSIA; 3°25′N, 101°45′E; reported as probably present Jul. 1978–Jun. 1981 by C. W. Marsh and W. L. Wilson (1981, p. 232). FAS; B:WM-19.

Bungara, Area III, Bohorok district; *Sumatra,* INDONESIA; ca. 3°32′N, 98°12′E; 3 troops observed 10 Aug. 1983–18 Apr. 1984 by K. J. Gurmaya (1989, p. 66). FAS; B:S-20.

Bunguran Island. See Binjai, Sungai; Sinubing; and Ulu, Sungai.

"Bungur-Buikt"; *Sumatra,* INDONESIA; not located, 5°38′N–5°57′S, 95°12′–106°05′E; collected 2 Dec. 1908 by [H.] Schoede; ZMB, 1. FAS; not mapped.

Bunoa, Pulo. See *Benua, Pulau.*

Buntok, Sungai Barito, 20 ft (= 6 m); *Borneo: Kalimantan,* INDONESIA; 1°42′S, 114°48′E; collected 6 Oct. 1909 by G. C. Shortridge; BM(NH), 1. FAS; C:K-31.

Burau, Pulau, MALAYSIA: WEST MALAYSIA; 6°21′N, 99°41′E; collected 14 Dec. 1916 by H. C. Robinson (see H. C. Robinson & Kloss, 1910, p. 664); BM(NH), 1. FAS; B:SM-1.

Buraw. See *Burau, Pulau.*

[?BURMA]; ?10°00′–21°00′N, 92°00′–98°30′E; collected date unknown by unknown collector; BNHS, 1 (skin only). Subspecies uncertain; not mapped.

Bur ni Bebuli, north of Danau Laut Tawar, ca. 2000 m; *Sumatra,* INDONESIA; ca. 4°40′N, 96°52′E; observed 2 Nov. 1905 by W. Volz (1912, pp. 88, 369). FAS; B:S-9.

Busang, Sungai, left bank, 6 km above mouth; *Borneo: Kalimantan,* INDONESIA; ca. 0°06′S, 113°57′E; observed 2–4 Sep. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Busang, Sungai, right bank, 1 km above mouth; *Borneo: Kalimantan,* INDONESIA; ca. 0°08′S, 113°58′E; observed 2–4 Sep. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Butang, Ko, THAILAND; 6°32′N, 99°12°E; collected 4 Apr. 1911 by H. C. Robinson; BM(NH), 1. FAS; A:T-58.

Buyan, Danau, -Danau Bratan region; *Pulau Bali,* Lesser Sunda Islands, INDONESIA; ca. 8°15′S, 115°09′E; observed ca. 1993 by B. P. Wheatley, A. Fuentes, and D. K. Harya Putra (1993, p. 1). FAS; C:LS-3.

Cabang Panti Research Station, Gunung Palung National Park; *Borneo: Kalimantan,* INDONESIA; 1°13′S, 110°08′E; observed Jan.–Jun. 1988 by C. H. Cannon and M. Leighton (1994, p. 509). FAS; C:K-1.

Cagar Alam Lembah Anai; *Sumatra,* INDONESIA; not located; observed Feb. 1990 by M. Bismark (1992, p. 11). FAS; not mapped.

Camara, Bantam region; *Java,* INDONESIA; 6°36′S, 105°37′E; collected 27 Jul. 1932 by P. F. Franck; MZB, 1. FAS; B:J-13.

CAMBODIA; 10°24′–14°41′N, 102°20′–107°38′E; collected [1858–186i] by H. Mouhot (1864, map at end of vol. 2; cf. Schlegel, 1876, p. 104); RMNH,

1 (skin only). Collected 1 Dec. 1960 by unknown collector; MNHN, 1. FAS; A:C-1 through C-3.

"Camboja" or "Cochinchine"; CAMBODIA or VIETNAM; 8°33′–14°41′N, 102°21′–107°39′E; collected ca. 1878 by M. Pierre (cf. P. H. Napier, 1981, p. 19; undocumented restriction of locality to "Tay Ninh"); BM(NH), 2 (skins only). FAS; not mapped.

Cameron Highlands, 1500 m; MALAYSIA: WEST MALAYSIA; 4°28′N, 101°22′E; reported as probably present Jul. 1978–Jun. 1981 by C. W. Marsh and W. L. Wilson (1981, p. 232). FAS; B:WM-7.

Camorta Island, Nicobar Islands, INDIA; 8°01′–8°15′N, 93°28′–93°34′E; primates reported absent before 1903 by G. S. Miller, Jr. (1902b, p. 792; cf. Kloss, 1903a, p. 114). A:k.

Camp II, Juara side; *Pulau Tioman,* MALAYSIA: WEST MALAYSIA; ca. 2°48′N, 104°12′E; observed Mar.–Apr. 1962 by Lord Medway (1966, p. 16). FAS; B:SCS-3.

Campbell Bay vicinity; *Great Nicobar Island,* INDIA; ca. 6°59′N, 93°55′E; observed 27 Feb.–8 Mar. 1986 by R. Grubh (see Abdulali, 1967, p. 143). UMB; A:N-4.

Candiroto, 600 m; *Java,* INDONESIA; 7°10′S, 110°03′E; collected 20 Jun. 1929 by H. J. V. Sody; RMNH, 1. FAS; C:J-25.

Cape Patani. See Pho, Laem.

Cape Rachado Forest Reserve. See Tanjong Tuan, Keramat.

Car Nicobar Island, INDIA; 9°07′–9°16′N, 92°44′–92°51′E; primates reported absent before 1903 by G. S. Miller, Jr. (1902b, p. 792; cf. Kloss, 1903a, p. 114). A:i.

Catur, Gunung; *Pulau Bali,* Lesser Sunda Islands, INDONESIA; ca. 8°14′S, 115°11′E; observed ca. 1993 by B. P. Wheatley, A. Fuentes, and D. K. Harya Putra (1993, p. 1). FAS; C:LS-3.

Celebes. See *Sulawesi, Pulau.*

Chang, Ko, THAILAND; 11°57′–12°09′N, 102°16′–102°28′E; collected 9–11 Dec. 1914 by C. B. Kloss (1916b, p. 28); BM(NH), 1; USNM, 1; ZRC, 1. FAS; A:T-35.

Changi; *Singapore Island,* SINGAPORE; 1°23′N, 103°59′E; collected 22 Jul. 1908 by H. C. Robinson (in Thomas & Wroughton, 1909b, p. 102) and E. Seimund; BM(NH), 1. FAS; B:SCS-7.

Changkat Budiman. See Keroh Forest Reserve.

Changkat Mentri; MALAYSIA: WEST MALAYSIA; 3°44′N, 101°15′E; collected 19–23 Sep. 1918 by C. B. Kloss (see P. H. Napier, 1981, p. 14); BM(NH), 2. FAS; B:WM-18.

Chao Phraya, Mae Nam, below Bangkok; THAILAND; ca. 13°40′N, 100°33′E; observed Apr.–May 1912 and 1914–1915 by N. Gyldenstolpe (1914, p. 3; 1917b, p. 6). FAS; A:T-30.

Cheraka Klang, Bukit. See Cherakah, Bukit.

Cherakah, Bukit; MALAYSIA: WEST MALAYSIA; 3°14′N, 101°23′E; collected 16–17 Nov. 1910 by museum collector; BM(NH), 1; ZRC, 1 FAS; B:WM-18.

Cheribon. See Cirebon.

Cherok Paloh. See Kampong Cherok Paloh.

Chiang Mai, northwest; THAILAND; ca. 19°15′N, 98°45′E; unconfirmed report, source unspecified, cited by Varavudhi et al. (1992, p. 338; cf. Fooden, 1971, p. 28). Not mapped.

Chiew Larn Reservoir; THAILAND; ca. 9°05′N, 98°40′E; rescued from flooding 1986–1987 by Royal Forest Deparment (Nakhasathien, 1989, p. 150). AUR/FAS/MUL; A:T-47.

Chittagong Hill Tracts; BANGLADESH; ca. 22°30′N, 92°20′E; improbable report (M. A. R. Khan, 1981, p. 13; 1985, p. 30). Not mapped.

Christmas Island, AUSTRALIA; ca. 10°23′–10°34′S, 105°34′–105°46′E; primates reported absent 1897–1898 by C. W. Andrews (1900, p. 22). Not mapped.

Chumphon, Khlong, mouth; THAILAND; 10°22′N, 99°10′E; collected 7 Jul. 1917 by W. J. F. Williamson and M. A. Smith (see Kloss, 1917, p. 289); ZRC, 2. AUR/FAS/MUL; A:T-44.

Cihara, Bantam region; *Java,* INDONESIA; 6°52′S, 106°06′E; collected 11 Nov. 1909 by O. Bryant (field catalog); USNM, 2. FAS; B:J-11.

Cikarang forest; *Java,* INDONESIA; 6°15′S, 107°09′E; collected 9 May 1858 by J. Zelebor ([1869], p. 7); museum unknown, 1 (not seen). FAS; B:J-19.

Cikujang, Bantam region; *Java,* INDONESIA; 6°41′S, 107°03′E; collected 8 Aug. 1932 by P. F. Franck; MZB, 2. FAS; B:J-20.

Cilacap, sea level; *Java,* INDONESIA; 7°44′S, 109°00′E; collected 19 Oct. 1907 by G. C. Shortridge (see Thomas & Wroughton, 1909a, p. 373); BM(NH), 2. FAS; B:J-1.

Cirebon; *Java,* INDONESIA; 6°44′S, 108°34′E; collected 18 Dec. 1927 by K. Fritsche; NMS, 1 (skull only). Collected before 1948, possibly by J. J. Menden; RCS(OM), 6 (skulls only). FAS; B:J-23.

Cirebon, 600 m; *Java,* INDONESIA; ca. 6°44′S, 108°34′E; collected 18 Feb. 1933 by J. J. Menden; AMNH, 2. FAS; B:J-23.

Ciremay, Gunung, 600 m (1 specimen) and 800 m (6 specimens); *Java,* INDONESIA; 6°54′S,

108°24′E; collected 11 Mar.–8 Apr. 1933 by J. J. Menden; AMNH, 7. FAS; B:J-23.

Ci Tanduy. See Kalipucang.

Ciwangi, 4000 ft (= 1200 m); *Java,* INDONESIA; 7°04′S, 107°02′E; collected 25 Sep.–1 Oct. 1907 by G. C. Shortridge (see Thomas & Wroughton, 1909a, p. 373); BM(NH), 2. 1 FAS; B:J-8.

Cochin China [region]; VIETNAM; 8°33′–12°17′N, 104°30′–107°39′E; collected before 1882 by M. Boucard; BM(NH), 1. Collected before 1883 by M. Germain; MNHN, 1. FAS; A:V-3 through V-5.

Cocos Islands. See *Tikus, Pulu.*

Condor, P. See *Con Son.*

Condore, P. See *Con Son.*

Con Son, VIETNAM; 8°40′–8°47′N, 106°32′–106°39′E; observed 20–28 Jan. 1780 by J. King (1784, p. 462). Observed 22–23 Aug. 1822 by J. Crawfurd (1828, p. 199). Collected before 1893 by M. Germain, MNHN, 2 (including 1 skin only, 1 skull only). Collected 19–23 Sep. 1919 by M. A. Smith; BM(NH), 3. Collected 6–18 Nov. 1920 by W. J. F. Williamson and C. Hose (see Kloss, 1926, p. 357; Weitzel et al., 1988, p. 110); BM(NH), 1; ZRC, 3 (including 1 skin only). CON; A:V-7.

Con Son, west shore, VIETNAM; ca. 8°43′N, 106°34′E; observed 20–25 Mar. 1969 by P. F. D. Van Peenen, M. L. Cunningham, and J. F. Duncan (1970, p. 421). CON; A:V-7.

Cox's Bazar Forest Division. See Bilasodia, Bimirdia, Ghorardia, Ochodia, and Rukumodia.

Dalam, Lhok; *Pulau Simeulue,* INDONESIA; 2°40′N, 96°08′E; collected 18–26 Nov. 1901 by W. L. Abbott (see Miller, 1903a, p. 437); USNM, 6. FUS; B:IO-2.

Damansara; MALAYSIA: WEST MALAYSIA; 3°08′N, 101°38′E; laboratory animals obtained before 1982 by unknown collector (Nordin, 1981, p. 164). FAS; B:WM-19.

Dampit. See Wonokojo (?= Wonokerto), Dampit district, southern Malang region.

Danau, Rawa; *Java,* INDONESIA; 6°09′S, 105°59′E; blood samples taken in 1979 by Y. Kawamoto and Tb. M. Ischak (1981, p. 238). FAS; B:J-15.

Darvel Bay; *Borneo,* MALAYSIA: SABAH; 4°50′N, 118°30′E; collected 21 Apr. 1909 by Dr. Pagel; ZMB, 1. FAS; C:Sab-22.

Dasun Tua. See Dusun Tua.

Datu, Pulau. See *Datuk, Pulau.*

Datuk, Pulau, INDONESIA; 0°09′–0°10′N, 108°38′–108°39′E; monkeys reported absent 2–4 May 1907 by W. L. Abbott (in Lyon, 1911, p. 59). B:m.

Deli. See Medan.

Deli, Pulau, INDONESIA; 7°00′–7°01′S, 105°31′–105°34′E; introduced in 1987 by C. V. Primates (Indonesia) (advertising leaflet, ca. 1993). Subspecies uncertain; not mapped.

Deli, Sungai, between Belawan and Labuhandeli, sea level; *Sumatra,* INDONESIA; 3°46′N, 98°41′E; collected 17 Mar. 1939 by F. Ulmer (in Miller, 1942, p. 127; cf. Schauensee & Ripley, 1940a, p. 311); ANSP, 4 (including 2 fetuses in alcohol) FAS; D:S-21.

DeLisle Island. See *Phayam, Ko.*

Deli Terbanjawan. See Terbanjawan.

Depok; *Java,* INDONESIA; 6°24′S, 106°50′E; collected 17 Jun. and 6 Jul. 1909 by O. Bryant and W. Palmer (see field catalog, USNM); MCZ, 2. FAS; B:J-17.

Depok, small forest near; *Java,* INDONESIA; ca. 6°24′S, 106°50′E; observed 1932–1957 by A. Hoogerwerf (1970, p. 408). FAS; B:J-17.

Desa Poetjang, Gunung Agung; *Pulau Bali,* Lesser Sunda Islands, INDONESIA; ca. 8°21′S, 115°30′E; collected ca. 1930 by H. J. V. Sody (1933, p. 93); RMNH, 2. FAS; C:LS-3.

Dewhurst Bay area; *Borneo,* MALAYSIA: SABAH; ca. 5°35′N, 118°35′E; observed May–Jun. 1950 by D. D. Davis (1962, p. 57). FAS; C:Sab-20.

Dindding I.; *Borneo,* MALAYSIA: SARAWAK; not located, 0°43′–4°58′N, 109°34′–115°38′E; collected before 1906 by H. C. Robinson (see P. H. Napier, 1981, p. 14); BM(NH), 1 (skin only). FAS; not mapped.

Dindings. See Hantu, Tanjong, Dindings.

Dirk de Vries Bay. See Pangandaran, Teluk Parigi.

Desertion Creek, Elephant Point, bank of Irrawaddy River, near Rangoon; BURMA; ca. 16°29′N, 96°20′E; collected before 27 Jan. 1876 by J. Armstrong (see J. Anderson, 1881, p. 63; Khajuria, [1955], p. 109). ZSI, 1 (not seen). AUR; A:Bu-6.

Djambajan, Sungai. See Jembayan, Sungai.

Djapura. See Japura.

Djasinga. See Jasinga.

Djeboes. See Jebus.

Djembrana. See Jembrana.

Dolok Tinggi Radja Reserve; *Sumatra,* INDONESIA; ca. 3°07′N, 98°45′E; reported present before 1972 by IUCN (1971, p. 276). FAS; B:S-27.

Domel Island. See *Letsok-aw Kyun.*

Dompu, 66 m; *Pulau Sumbawa,* Lesser Sunda Islands, INDONESIA; 8°32′S, 118°28′E; collected 22 Dec. 1909 and in 1910 by J. Elbert (1912,

p. 98); NMS, 2 (including 1 skull only). Collected 28 May 1927 by Sunda-Expedition Rensch (see B. Rensch, 1930, p. 93; Mertens, 1930, p. 135; I. Rensch, 1934, p. 226); NMS, 2 (skulls only; including 1 not examined, measurements from Mertens, 1936, p. 319, and G. H. Albrecht, pers. comm., Oct. 1991). FAS; C:LS-11.

Don Poo Tao; THAILAND; 15°45′N, 104°22′E; observed 16–17 Jul. 1989 by N. Aggimarangsee (1992, pp. 109, 120; pers. comm., Oct. 1993). Subspecies uncertain; A:T-16.

Dulit, Bukit, 4000 ft (= 1200 m); *Borneo,* MALAYSIA: SARAWAK; 3°21′N, 114°11′E; collected Sep. 1891 and Mar. 1894 by C. Hose (1893, p. 8; altitude cited as 5000 ft); SMK, 1 (skin only, skull inside); ZMB, 1 (skull only). FAS; C:Sar-13.

Durai. See *Durian, Pulau.*

Durian, False. See *Sanglang-besar, Pulau.*

Durian, Pulau, Kepulauan Riau, INDONESIA; 0°42′–0°45′N, 103°42′–103°45′E; reported present Jun.–Aug. 1903 by W. L. Abbott (see Miller, 1906c, p. 279). Collected 18 Jun. 1923 by P. F. Franck (see Dammerman, 1926b, pp. 282, 302); MZB, 2. FAS; B:SCS-16.

Durian-kecil, Pulau, Kepulauan Riau, INDONESIA; 0°43′–0°45′N, 103°39′–103°42′E; reported present 6–9 Jul. 1903 by W. L. Abbott (see Miller, 1906c, p. 280). FAS; B:SCS-16.

Dusun, Sungai, 10 m; MALAYSIA: WEST MALAYSIA; 3°40′N, 101°20′E; observed Jul. 1978–Jun. 1981 by C. W. Marsh and W. L. Wilson (1981, p. 232). FAS; B:WM-18.

Dusun Tua; MALAYSIA: WEST MALAYSIA; 3°08′N, 101°50′E; collected 3 Oct. 1906 by E. Seimund (see Thomas & Wroughton, 1909b, p. 101); ZRC, 1. FAS; B:WM-19.

Eagle's Nest Trail, Kowloon Reservoir Area; UNITED KINGDOM: HONG KONG; ca. 22°21′N, 114°09′E; introduced population, observed Jan.–Feb. 1987 by C. H. Southwick and D. Manry (1987, p. 48). Subspecies uncertain; not mapped.

Elephant Point. See Desertion Creek, Elephant Point.

Empang area. See Ampang area.

Endau, Sungai, vicinity; MALAYSIA: WEST MALAYSIA; ca. 2°40′N, 103°38′E; observed 16 Oct.–2 Nov. 1892 by H. W. Lake and H. J. Kelsall (see Kelsall, 1894b, p. 16). FAS; B:WM-22.

Engano Id. See *Enggano, Pulau.*

Enggano, Pulau, INDONESIA; 5°17′–5°32′S, 102°05′–102°24′E; primates reported absent before 1928 by C. B. Kloss ([1928], p. 802; cf. Lyon, 1916, p. 460). Reported present Nov. 1971–Jan. 1973 by unspecified informants (Crockett & Wilson, 1980, p. 156). Pending further information, Kloss's report is accepted as valid. B:j.

Entawa, Tanjong, Sungai Samarahan; *Borneo,* MALAYSIA: SARAWAK; 1°17′N, 110°29°E; collected 21 Nov. 1919 by H. C. Robinson; BM(NH), 1. FAS; C:Sar-5.

E. Siam. See "Siam."

False Durian. See *Sanglang-besar, Pulau.*

Fatuboi; *Pulau Timor,* Lesser Sunda Islands, INDONESIA; ca. 8°50′S, 126°20′E; observed 28 Apr.–3 May 1883 by H. O. Forbes (1885, p. 471). FAS; C:LS-29.

Flores, Pulau, Lesser Sunda Islands, INDONESIA; 8°14′–8°58′S, 119°48′–123°02′E; collected 1854–1862 by A. R. Wallace; BM(NH), 1. FAS; C:LS-13 through LS-19.

Fort de Kock. See Bukittinggi.

Gaik Liew Estate, Damansara; MALAYSIA: WEST MALAYSIA; 3°07′N, 101°37′E; collected 13 Feb. 1921 by "T. H. S."; BM(NH), 1. FAS; B:WM-19.

Galang, Pulau, Kepulauan Riau, INDONESIA; 0°42′–0°48′N, 104°10′–104°18′E; collected 1 Jan. 1925 by F. N. Chasen; ZRC, 4. FAS; B:SCS-11.

Galang-baru, Pulau. See *Nguwal, Pulau.*

Gantang. See Kantang.

Garau, Kampong Kiau region, Mount Kinabalu, ca. 3000 ft (= 900 m); *Borneo,* MALAYSIA: SABAH; ca. 6°02′N, 116°31′E; collected 18–19 Aug. 1937 by J. A. Griswold, Jr. (1939a, p. 410); MCZ, 4. FAS; C:Sab-7.

Gasip, Sungai, ca. 10 km above mouth; *Sumatra,* INDONESIA; ca. 0°32′N, 101°44′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-42.

Gasip, Sungai, ca. 20 km above mouth; *Sumatra,* INDONESIA; ca. 0°37′N, 101°43′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-42.

Gedangan, Semarang district, 65 m; *Java,* INDONESIA; 7°11′S, 110°41′E; collected Jan. 1929–Oct. 1931 by H. J. V. Sody; RMNH, 7 (including 4 skulls only). Collected 6 Oct. 1931 by F. A. T. H. Verbeek; RMNH, 1 (skin only). FAS; C:J-29.

Gede, Gunung, Pangrango; *Java,* INDONESIA; 6°47′S, 106°59′E; observed Jan. 1991 by M. Bismark (1992, pp. 11, 13). FAS; B:J-18.

Ghirbi. See Ban Nong Kok.

Ghorardia, Naf River; BANGLADESH; ca. 21°05′N, 92°12′E; observed Sep. 1982–Feb. 1983 by M. A. R. Khan and M. A. Wahab (1983, p. 104; cf. M. A. R. Khan, 1981, p. 13; 1985, p. 30). AUR; A:Ba-1.

Gili Bodo. See *Sababi, Pulau.*

Gili Lawa Darat. See *Lawadarat, Gili.*

Gili Lawa Laut. See *Lawalaut, Gili.*

Gilimanuk; *Pulau Bali,* Lesser Sunda Islands, INDONESIA; 8°10′S, 114°26′E; collected 8–10 Apr. 1938 by V. von Plessen; AMNH, 8. FAS; C:LS-1.

Gili Mota. See *Motang, Gili.*

Gilla, Pulo. See *Jela, Pulau.*

Ginggo, Teluk; *Pulau Rinca,* Lesser Sunda Islands, INDONESIA; ca. 8°41′S, 119°39′E; observed 26 May–6 Jul. 1953 by A. Hoogerwerf (see Auffenberg, 1981, p. 242). FAS; C:LS-13.

Gitgit, 530 m; *Pulau Bali,* Lesser Sunda Islands, INDONESIA; 8°11′S, 115°08′E; collected 1 Aug. 1927 by Sunda-Expedition Rensch (see B. Rensch, 1930, p. 210; Mertens, 1930, p. 145; I. Rensch, 1934, p. 227); NMS, 1. FAS; C:LS-3.

Gn. Telapa Burok. See Telapak Burok, Gunong.

Goenoengsetan-Meloewak, 325–520 m; *Sumatra,* INDONESIA; 3°45′N, 97°40′E; collected 21 Jan. 1937 by A. Hoogerwerf (1941, p. 5; cf. Chasen, 1940b, p. 485); MZB, 1. FAS; B:S-13.

Goson Djerong, near, Sungai Makaham, south bank; *Borneo: Kalimantan,* INDONESIA; ca. 0°29′S, 117°02′E; collected 15 Jun. 1912 by H. C. Raven (see Deignan, [1960], p. 267); USNM, 2 (including 1 skull only). FAS; C:K-49.

Grabi. See Ban Nong Kok.

Great Natuna Island. See *Natuna Besar, Pulau.*

Great Nicobar Island, INDIA; 6°45′–7°14′N, 93°38′–93°57′E; captive obtained Mar. 1858 by J. Zelebor ([1869], p. 7; cf. Fitzinger, 1861, p. 389). Collected 8–12 Mar. 1901 by W. L. Abbott; USNM, 2. Observed Apr.–May 1975 by P. K. Das and D. K. Ghosal (1977, p. 265). UMB; A:N-3, N-4.

Great Redang Island. See *Redang, Pulau.*

Great Tenasserim River, mouth; BURMA; ca. 12°24′N, 98°37′E; observed before 1852 by F. Mason (1851, p. 220). AUR; A:Bu-18.

Gulf of Siam, coast. See Si Racha vicinity.

Gumpang, near; *Sumatra,* INDONESIA; ca. 3°51′N, 97°33′E; blood samples taken Nov.–Dec. 1986 by J. R. de Ruiter (1993, p. 91). FAS; B:S-13.

Gunong Mulu National Park; *Borneo,* MALAYSIA: SARAWAK; ca. 4°00′N, 114°55′E; reported as food of local residents Jan. 1978 by D. Labang and Lord Medway (1979, p. 56). FAS; C:Sar-21.

Gunung Halimun Reserve; *Java,* INDONESIA; ca. 6°15′S, 106°30′E; observed Jul. 1989 by K. M. Kool (1992, p. 32). FAS; B:J-16.

Gunung Leuser Reserve; *Sumatra,* INDONESIA; ca. 3°45′N, 97°11′E; observed Apr.–Aug. 1970 by F. Kurt (1973, p. 64). FAS; B:S-12.

Gunung Palung Nature Reserve; *Borneo: Kalimantan,* INDONESIA; ca. 1°13′S, 110°08′E; reported present before 1983 by G. Davies ([1983], p. 148). FAS; C:K-1.

Hainggyi Kyun, BURMA; 15°98′–16°01′N, 94°17′–94°22′E; reported present before 1880 by J. Anderson (1879, p. 76). AUR; A:Bu-4.

Halimun, Gunung. See Gunung Halimun Reserve.

Handeuleum, Pulau, INDONESIA; 6°45′S, 105°25′E; 3 individuals captured before 1974 by W. Angst (1973, p. 627). FAS; B:J-14.

Hantakan, 3 km N of Pagat, 50 m; *Borneo: Kalimantan,* INDONESIA; 2°38′S, 115°27′E; collected 2 Feb. 1971 by NAMRU 2 Djakarta Detachment (see Van Peenen et al., 1974, p. 391); USNM, 1. FAS; C:K-29.

Hantu, Tanjong, Dindings; MALAYSIA: WEST MALAYSIA; 4°19′N, 100°34′E; collected 19 Jul. 1918 by unknown collector; ZRC, 1. FAS; B:WM-6.

Harileko, Batang, ca. 12 km above mouth; *Sumatra,* INDONESIA; ca. 2°52′S, 104°01′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-62.

Harileko, Batang, ca. 24 km above mouth; *Sumatra,* INDONESIA; ca. 2°48′S, 103°57′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-62.

Harileko, Batang, ca. 36 km above mouth; *Sumatra,* INDONESIA; ca. 2°45′S, 103°52′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-62.

Harileko, Batang, ca. 48 km above mouth; *Sumatra,* INDONESIA; ca. 2°42′S, 103°47′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-62.

Harileko, Batang, ca. 60 km above mouth; *Sumatra,* INDONESIA; ca. 2°38′S, 103°42′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-62.

Harileko, Batang, ca. 72 km above mouth; *Sumatra,* INDONESIA; ca. 2°34′S, 103°37′E; ob-

served Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-62.

Harileko, Batang, ca. 84 km above mouth; *Sumatra,* INDONESIA; ca. 2°31′S, 103°32′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-62.

Harileko, Batang, ca. 96 km above mouth; *Sumatra,* INDONESIA; ca. 2°28′S, 103°27′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-62.

Hat Chao Mai National Park; THAILAND; ca. 7°20′N, 99°25′E; reported present 17–21 Dec. 1987 by park employees (Boonratana, 1988, p. 76). FAS; A:T-56.

Hat Noppharat Thara-Mu Ko Phi Phi National Park; THAILAND; ca. 8°02′N, 98°47′E; reported present 9–12 Dec. 1987 by local residents (Boonratana, 1988, p. 76). FAS; A:T-60.

Haungdarau. See Haungtharaw.

Haungtharaw; BURMA; 16°30′N, 98°13′E; collected 10 Dec. 1880 by Mr. Limborg and J. Anderson; ZSI, 4 (including 3 skins only, skulls inside). AUR; A:Bu-10.

Haut Padang. See Padang highlands.

Henry Larence Island, Andaman Islands, INDIA; 12°05′–12°13′N, 93°03′–93°07′E; primates reported absent before 1903 by G. S. Miller, Jr. (1902b, p. 792; cf. Kloss, [1928], p. 802; Chaturvedi, 1980, p. 134). A:c.

Hilisimaetano; *Pulau Nias,* INDONESIA; 0°38′N, 97°44′E; collected 5–6 Jun. 1939 by F. Ulmer (in Miller, 1942, p. 129; cf. Schauensee & Ripley, 1940b, p. 399); ANSP, 3. FAS; B:IO-8.

Ho Chi Minh City; VIETNAM; 10°45′N, 106°40′E; collected in 1929 by T. Roosevelt (see Osgood, 1932, p. 208); FMNH, 1. Collected date unknown by H. Zeltmann; NMS, 2 (skins only). FAS; A:V-4.

Ho Chi Minh City, Botanical Gardens; VIETNAM; 10°45′N, 106°40′E; collected Oct. 1926–Sep. 1927 by J. Delacour and W. P. Lowe (see Thomas, 1928, p. 832); BM(NH), 1 (skin only); MNHN, 2 (including 1 skin only, 1 skull only). FAS; A:V-4.

Ho Chi Minh City, Zoological Garden; VIETNAM; 10°45′N, 106°40′E; collected 26 Jul. 1926 and 11 Oct. 1926 by unknown collectors; MNHN, 2 (including 1 skull only). FAS; A:V-4.

Hong Kong. See Eagle's Nest Trail, Kam Shan Entrance, Kowloon Reservoir Area, and Lower Taipo Road.

Huai Ong Sit. See Ban Phu Toie.

Huaytakaeng. See Wat Huai Takhaeng.

Huay Takang. See Wat Huai Takhaeng.

Hutan Lindung Lintau Buo; *Sumatra,* INDONESIA; not located; observed Aug. 1990 by M. Bismark (1992, p. 11). FAS; not mapped.

"I. Lendung"; *Sumatra,* INDONESIA; not located, 5°38′N–5°57′S, 95°12′–106°05′E; collected data unknown by C. Bruegel; ZSBS, 3 (skins only). FAS; not mapped.

Indau River. See Endau, Sungai, vicinity.

Indragiri, Sungai; *Sumatra,* INDONESIA; ca. 0°22′S, 103°26′E; collected 21 Sep. 1901 by W. L. Abbott (see Miller, 1902a, p. 143); USNM, 1. FAS; B:S-58.

Indragiri district; *Sumatra,* INDONESIA; 0°10′–0°55′S, 101°50′–103°30′E; collected 6 Dec. 1898 by G. Schneider (1905, p. 72); ZMUZ, 1 (skull only). Collected in 1905 by H. Kummer; NHMBa, 7 (skulls only). FAS; B:S-56.

Indragiri (Djapura). See Japura.

Indramayu; *Java,* INDONESIA; 6°20′S, 108°19′E; collected 30 Jul. 1930 and 29 Mar. 1931 by J. J. Menden; MZB, 4 (including 2 skins only). FAS; B:J-21.

Indramojoe. See Indramayu.

Irrawaddy River, right bank, northwest of Mandalay; BURMA; ca. 22°05′N, 96°00′E; captive (presumably introduced) obtained before 1880 by Dr. Marfels (see J. Anderson, 1879, p. 74). Subspecies uncertain; not mapped.

Isle de France. See *Mauritius Island.*

Jalor. See Kampong Biserat.

Jambi, ca. 60 km NNW; *Sumatra,* INDONESIA; ca. 1°05′S, 103°31′E; reported before 1981 by M. Borner (Crockett & Wilson, 1980, p. 156). FAS; B:S-59.

Jambi, ca. 90 km ENE; *Sumatra,* INDONESIA; ca. 1°16′S, 104°21′E; reported before 1981 by M. Borner (Crockett & Wilson, 1980, p. 156). FAS; B:S-60.

Jambu, tidal creeks near. See Yaring, tidal creeks near.

Japura; *Sumatra,* INDONESIA; ca. 0°19′S, 102°21′E; collected 1897–1899 by G. Schneider (1905, p. 72); museum and number of specimens unknown (possibly ZMUZ 11668, skull only). FAS; B:S-55.

Jarak, Pulau, MALAYSIA: WEST MALAYSIA; 3°59′N, 100°06′E; primates reported absent 1950–1960 by J. L. Harrison and J. R. Hendrickson (1963, p. 548). B:b.

Jasinga, Bogor district; *Java,* INDONESIA; 6°29′S, 106°27′E; collected 10 Apr. 1929 and 4 Sep. 1931 by P. F. Franck; MZB, 2. FAS; B:J-10.

Jatibarang; *Java,* INDONESIA; 6°28′S, 108°17′E;

clinical examination in 1980 by K. Matsubayashi and D. Sajuthi (1981, p. 48). FAS; B:J-21.

Java, INDONESIA; 5°53′–8°47′S, 105°07′–114°37′E; collected in 1827 by van Swindern; NMS, 1. Collected in 1832 by unknown collector; NHMBa, 1 (skull only). Collected in 1836 by Ouvermer-Fischer; NMS, 2 (skulls only). Two captives obtained in 1858 by J. Zelebor or von Frauenfeld (see Fitzinger, 1861, pp. 385, 388). Acquired before 1859 by C. J. Temminck; RMNH, 2 (skulls only). Collected 10 Jan. 1866 by Kok; RMNH, 1 (skin only, skull inside). Collected in 1898 by Bartels; NHRM, 17 (including 16 skulls only, 1 mandible only). Collected date unknown by Bartels; NHRM, 1 (skull only). Collected before 1924 by Tucker; ZMUZ, 1 (skin, No. 11627/skeleton, No. 11630). Collected before 1925 by unknown collector; NHMBa, 3 (skins only). Collected 14 Jan. 1932 by L. Heinrath; ZMB, 1 (skull only). Collected before 1935 by unknown collector; RMNH, 2 (skulls only). Collected in 1936 and 1937 by C. Blazer; RMNH, 30 (including 24 skulls only). Collected before 1942 by E. Dubois; RMNH, 1 (skull only). Collected date unknown by van Aken; RMNH, 1 (skull only). Collected date unknown by Hecht; ZMB, 1. Collected date unknown by T. B. Wilson; ANSP, 1 (skull only). Collected date unknown by unknown collector; RMNH, 9 (including 6 skins only [skulls inside], 3 skulls only); SMTD, 1 (skin only). FAS; not mapped.

Java, west, INDONESIA; 5°52′–7°48′S, 105°12′–108°52′E; collected 1818–1826 by C. L. Blume; RMNH, 2 (including 1 skin only [skull inside], 1 skeleton only). Collected 1820–1821 by H. Kuhl and J. C. van Hasselt; RMNH, 1 (skeleton only). Collected 1826–1837 by S. Müller and H. C. Macklot; RMNH 2 (skins only, skulls inside). Collected in 1863 by P. Diard; RMNH, 5 (including 1 skin only, 1 skeleton only). Collected date unknown by P. Diard; RMNH, 1 (skeleton only). Collected in 1870 by unknown collector; RMNH, 1 (skin only, skull inside). Examined for parasites before 1970 by D. Weinman and N. S. Wiratmadja (1969, p. 499). FAS; not mapped.

Jebus; *Pulau Bangka,* INDONESIA; 1°44′S, 105°29′E; collected ca. 1935 by H. J. V. Sody (1937, p. 248); RMNH, 1 (skull only). FAS; B:SCS-18.

Jela, Pulau, INDONESIA; 0°57′–0°58′N, 107°29′–107°30′E; observed 3–7 Aug. 1899 by W. L. Abbott (in Miller, 1900, p. 243; cf. Kloss, 1903b, p. 60). FAS; B:SCS-26.

Jeleket, ca. 10 km W; *Sumatra,* INDONESIA; ca. 3°27′S, 102°15′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-68.

Jeleket vicinity; *Sumatra,* INDONESIA; ca. 3°27′S, 102°20′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-68.

Jemaja, Pulau, INDONESIA; ca. 2°49′–3°03′N, 105°41′–105°51′E; observed 16–28 Sep. 1899 by W. L. Abbott (in Miller, 1900, p. 244; cf. Kloss, 1903b, p. 74). FAS; B:SCS-28.

Jembayan, Sungai; *Borneo: Kalimantan,* INDONESIA; 0°35′S, 117°00′E; collected 6–14 May 1914 by H. C. Raven (see Deignan, [1960], p. 269); USNM, 3 (skulls only). FAS; C:K-49.

Jembrana, Negara district; *Pulau Bali,* Lesser Sunda Islands, INDONESIA; 8°22′S, 114°39′E; collected ca. 1930 by H. J. V. Sody (1933, p. 93); RMNH, 2 (including 1 skin not examined). FAS; C:LS-2.

Jering region. See Yaring region.

Jessleton (= Kota Kinabalu). See Papar; Talibang; Tuaran.

Jimaja. See *Jemaja, Pulau.*

Jockaboemi; *Java,* INDONESIA; not located, 5°93′–8°47′S, 105°12′–114°36′E; collected 7 Jun. 1909 by Dr. Biedermann; ZMB, 1 (skull only). FAS; not mapped.

Johore Archipelago. See *Pemanggil, Pulau.*

Jolir dia, Naf River; BANGLADESH; ca. 20°50′N, 92°18′E; reported present 1982–1983 by M. A. R. Khan and M. A. Wahab (1983, p. 104; cf. M. A. R. Khan, 1981, p. 13; 1985, p. 30). AUR; A:Ba-2.

Joloi River. See Julai, Sungai.

Juara, Telok; *Pulau Tioman,* MALAYSIA: WEST MALAYSIA; 2°48′N, 104°13′E; collected 10 Jun. 1906 by H. C. Robinson; BM(NH), 1. Collected 9–10 Sep. 1907 by museum collector; BM(NH), 2. Collected 4–22 Jun. and 1–2 Jul. 1915 by H. C. Robinson; BM(NH), 2; ZRC, 2. FAS; Ba:SCS-3.

Julai, Sungai, left bank, 1 km below mouth of Sungai Busang; *Borneo: Kalimantan,* INDONESIA; ca. 0°09′S, 113°59′E; observed 2–4 Sep. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Julai, Sungai, left bank, 2 km above Muarajuloi; *Borneo: Kalimantan,* INDONESIA; ca. 0°11′S, 114°03′E; observed 30 Aug.–8 Sep. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Julai, Sungai, left bank, 4 km above Muarajuloi; *Borneo: Kalimantan,* INDONESIA; ca. 0°10′S,

114°03′E; observed 30 Aug.–8 Sep. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Julai, Sungai, right bank, 1 km above mouth of Sungai Busang; *Borneo: Kalimantan,* INDONESIA; ca. 0°11′S, 113°58′E; observed 1–2 Sep. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Julai, Sungai, right bank, 3 km below mouth of Sungai Busang; *Borneo: Kalimantan,* INDONESIA; ca. 0°08′S, 114°00′E; observed 30 Aug.–1 Sep. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Julai, Sungai, right bank, 6 km above Muarajuloi; *Borneo: Kalimantan,* INDONESIA; ca. 0°09′S, 114°02′E; observed 30 Aug.–8 Sep. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Jumpit [?= Jumbit]; *Borneo,* MALAYSIA: SARAWAK; ?1°07′N, 111°26′E; collected date unknown by Rupert; ZMB, 1 (skull only). FAS; C:Sar-10.

Juyan, Sungai, right bank, near mouth, Kutai Reserve; *Borneo: Kalimantan,* INDONESIA; ca. 0°27′N, 117°12′E; observed 13 Oct. 1985 by A. Suzuki (1986, p. 16). FAS; C:K-47.

Kaban, Pulau. See *Acheh, Pulau.*

Kaboerau [?= Keburau]; *Borneo: Kalimantan,* INDONESIA; ca. 2°41′N, 117°07′E; collected 9 Jan. 1914 by C. Lumholtz (see Gyldenstolpe, 1920, p. 3); Zoological Museum, Christiana, 1 (not seen). FAS; C:K-39.

Kadan, Kyun, 500 ft (= 150 m), BURMA; 12°18′–12°42′N, 98°18′–98°29′E; collected 3 Oct. 1923 by C. Primrose (see Lindsay, 1926, p. 42); BM(NH), 1. AUR; A:Bu-17.

Kaddamayan River. See Tempasuk, Sungai.

Kaget, Pulau; *Borneo: Kalimantan,* INDONESIA; ca. 3°25′S, 114°30′E; observed in 1983 by K. S. MacKinnon (1986, p. 112). Observed 1988–1991 by C. H. Southwick and B. Rosenbaum (1992, p. 88). FAS; C:K-25.

Kahayan, Sungai, left bank, 60 km above mouth of Sungai Rungan; *Borneo: Kalimantan,* INDONESIA; ca. 1°38′S, 113°56′E; 3 troops observed Jul. 1984–May 1986 by K. M. Burton (see Chivers & Burton, [1991], p. 140). FAS; C:K-21.

Kahayan, Sungai, left bank, 120 km above mouth of Sungai Rungan; *Borneo: Kalimantan,* INDONESIA; ca. 1°08′S, 113°54′E; observed Jul. 1984–May 1986 by K. M. Burton (see Chivers & Burton, [1991], p. 140). FAS; C:K-20.

Kahayan, Sungai, left bank, above mouth of Sungai Rungan; *Borneo: Kalimantan,* INDONESIA; ca. 2°08′S, 113°56′E; 2 troops observed Jul. 1984–May 1986 by K. M. Burton (see Chivers & Burton, [1991], p. 140). FAS; C:K-23.

Kahayan, Sungai, left bank, below mouth of Sungai Rungan; *Borneo: Kalimantan,* INDONESIA; ca. 2°15′S, 114°00′E; observed Jul. 1984–May 1986 by K. M. Burton (see Chivers & Burton, [1991], p. 140). FAS; C:K-23.

Kahayan, Sungai, right bank, 120 km above mouth of Sungai Rungan; *Borneo: Kalimantan,* INDONESIA; ca. 1°08′S, 113°52′E; observed Jul. 1984–May 1986 by K. M. Burton (see Chivers & Burton, [1991], p. 140). FAS; C:K-20.

Kahayan, Sungai, right bank, 180 km above mouth of Sungai Rungan; *Borneo: Kalimantan,* INDONESIA; ca. 0°54′S, 113°12′E; observed Jul. 1984–May 1986 by K. M. Burton (see Chivers & Burton, [1991], p. 140). FAS; C:K-15.

Kahayan, Sungai, right bank, below mouth of Sungai Rungan; *Borneo: Kalimantan,* INDONESIA; ca. 2°15′S, 114°00′E; observed Jul. 1984–May 1986 by K. M. Burton (see Chivers & Burton, [1991], p. 140). FAS; C:K-23.

Kajan, Sungai. See Long Peleben.

Kalianda, 100 m; *Sumatra,* INDONESIA; 5°45′S, 105°38′E; collected 5 Aug. 1934 by J. J. Menden; AMNH, 3. FAS; B:S-87.

Kaligoea, Gunung Slamet, 1350 m; *Java,* INDONESIA; ca. 7°14′S, 109°12′E; collected 18 Jan. 1917 by Denin; MZB, 2. FAS; B:J-24.

Kalipoetjang. See Kalipucang.

Kalipucang, Ci Tanduy, sea level; *Java,* INDONESIA; 7°39′S, 108°44′E; collected 10 Mar. 1908 by G. C. Shortridge (see Thomas & Wroughton, 1909a, p. 373); BM(NH), 3. FAS; B:J-2.

Kalulong, [Bukit]; *Borneo,* MALAYSIA: SARAWAK; 3°14′N, 114°39′E; collected Oct.–Nov. 1932 by Oxford University Expedition to Borneo (see Harrisson, 1933, p. 402; P. H. Napier, 1981, p. 14); BM(NH), undetermined portion of 6 specimens (including 1 skin only and 3 skulls only) collected at Kalulong or Belaga (C:Sar-12). FAS; C:Sar-20.

Kambang; *Sumatra,* INDONESIA; 1°42′S, 100°42′E; collected 19 Nov. 1908 by [H.] Schoede; ZMB, 1. FAS; B:S-48.

Kambang, Poulo. See *Kambing, Pulau.*

Kambang, Pulau; *Borneo: Kalimantan,* INDONESIA; 3°19′S, 114°32′E; photographed before 1968 by Le Roux (see Roedelberger & Groschoff, 1967, p. 30). FAS; C:K-25.

Kambaniru. See Payeti-Kambaniru.

Kambas, Wai; *Sumatra,* INDONESIA; ca. 5°02′S,

105°52′E; observed in 1983 by K. S. MacKinnon (1986, p. 112). Observed Jun. 1988 by M. Bismark (1992, p. 11). Observed Jan.–Mar. 1989 by A. Yanuar and J. Sugardjito (1993, p. 34). FAS; B:S-84.

Kambera. See Payeti-Kambaniru.

Kambing, Pulau; *Pulau Sumbawa,* Lesser Sunda Islands, INDONESIA; 8°27′S, 118°42′E; collected 28 Jul. 1927 by Sunda-Expedition Rensch (see Mertens, 1930, p. 144; *M. fascicularis* reportedly introduced in Pulau Kambing from Bima by Sultan of Bima); MZB, 1. FAS; C:LS-12.

Kambing, Pulau, Lesser Sunda Islands, INDONESIA; 10°14′S, 123°26′E; collected Jun. 1829 by S. Müller and H. C. Macklot; RMNH, 1 (skin only). FAS; C:LS-24.

Kamoedian, Pulau. See Kemujan, Pulau.

Kamorta Island. See *Camorta Island.*

Kampong Biserat; THAILAND; 6°32′N, 101°14′E; collected 16 May 1901 by N. Annandale and H. C. Robinson (1903, p. xxv; cf. Bonhote, 1903, p. 3); BM(NH), 3 (including 1 skin only); SMTD, 1 (skull only). FAS; A:T-69.

Kampong Bundu Tuhan, Mount Kinabalu; *Borneo,* MALAYSIA: SABAH; 5°59′N, 116°32′E; collected 30 Jun.–18 Jul. 1951 by D. H. Johnson (see Coolidge, 1940, p. 124; Davis, 1962, p. 126); USNM, 4. FAS; C:Sab-7.

Kampong Cherok Paloh; MALAYSIA: WEST MALAYSIA; 3°37′N, 103°23′E; laboratory animals obtained 1954–1959 by unknown collector (Price, 1959, p. 499). FAS; B:WM-13.

Kampong Hadjak, Muaratewe district; *Borneo: Kalimantan,* INDONESIA; ca. 0°57′S, 114°53′E; collected 5 May 1932 by S. A. R. le Prince Leopold (see Frechkop, 1934, p. 25); IRSN, 1 (skin only). FAS; C:K-32.

Kampong Kiau. See Garau; Kiaulan; Tempasuk, Sungai; Tinonkok.

Kampong Kiau, 3000 ft (= 900 m); *Borneo,* MALAYSIA: SABAH; ca. 6°02′N, 116°31′E; collected 24–29 Apr. 1929 by F. N. Chasen (1931, p. 6); ZRC, 2. FAS; C:Sab-7.

Kampong Kiau, ca. 2200 ft (= 670 m); *Borneo,* MALAYSIA: SABAH; ca. 6°02′N, 116°31′E; collected 13–23 Aug. 1937 by J. A. Griswold, Jr. (1939b, p. 514; MCZ Asiatic Primate Expedition specimen list); MCZ, 2. FAS; C:Sab-7.

Kampong Kiau-Tenampok Pass, trail between, [ca. 1100 m]; *Borneo,* MALAYSIA: SABAH; ca. 6°00′N, 116°30′E; observed 3 Jun. 1932 by J. A. Griswold, Jr. (1939a, p. 410). FAS; C:Sab-7.

Kampong Menuggol; *Borneo,* BRUNEI; 4°53′N, 114°59′E; observed in 1972 by D. Macdonald (1982, pp. 62, 71). FAS; C:B-1.

Kampong Mukut, hillsides above; *Pulau Tioman,* MALAYSIA: WEST MALAYSIA; ca. 2°43′N, 104°11′E; observed Mar.–Apr. 1962 by Lord Medway (1966, p. 16). FAS; B:SCS-3.

Kampong Punkah. See Pongka, Kampung.

Kampong Rantau Panjang; MALAYSIA: WEST MALAYSIA; ca. 2°53′N, 101°29′E; examined for malaria before 1951 by E. P. Hodgkin (1950, p. 326). Observed Jul.–Sep. 1960 by Y. Furuya (1965, p. 287). FAS; B:WM-18.

Kampong Sungai Buloh, 150–300 ft (= ca. 70 m); MALAYSIA; WEST MALAYSIA; 3°15′N, 101°18′E; observed 1947–1957 by J. L. Harrison (1969, p. 176). FAS; B:WM-18.

Kampong Tanah Puteh, Pekan district; MALAYSIA: WEST MALAYSIA; 3°35′N, 103°22′E; examined for malaria ca. 1961–1962 by R. H. Wharton, D. E. Eyles, McW. Warren, and W. H. Cheong (1964, p. 58). FAS; B:WM-18.

Kampong Tenghilan. See Tuaran-Kampong Tenghilan Road, new bridge.

Kampong Titi Tinggi; MALAYSIA: WEST MALAYSIA; 6°38′N, 100°15′E; captive obtained in 1964 by local trappers (Collins et al., 1970, p. 509). FAS; B:WM-1.

Kampon Kadjak. See Kampong Hadjak.

Kampung Baru Study Area; *Borneo: Kalimantan,* INDONESIA; 1°06′S, 110°10′E; reported present 2 Apr.–9 May 1986 by Y. Ruhiyat (1986, p. 60). FAS; C:K-1.

Kam Shan Entrance, Kowloon Reservoir Area; UNITED KINGDOM: HONG KONG; ca. 22°22′N, 114°09′E; introduced population, observed Jan.–Feb. 1987 by C. H. Southwick and D. Manry (1987, p. 48). Subspecies uncertain; not mapped.

Kanaka; *Mauritius Island,* MAURITIUS; 19°59′–20°31′S, 57°18′–57°48′E; introduced population, collected 29 May 1975 by R. L. Ciochan; BM(NH), 1 (skull not examined). Subspecies uncertain; not mapped.

Kangean, Pulau, 4 ft (= 1 m), INDONESIA; 6°49′–7°00′S, 115°12′–115°34′E; collected 15–23 Nov. 1909 by G. C. Shortridge; BM(NH), 4. FAS; C:J-40.

Kantan, See Kantang.

Kantang; THAILAND; 7°25′N, 99°31′E; collected 11 Jan. 1918 by C. B. Kloss (see H. C. Robinson & Kloss, 1910, p. 668; Weitzel et al., 1988, p. 104; W. L. Abbott, 1897, unpubl. map in USNM archives); ZRC, 1. FAS; A:T-56.

Kapos Tinggi; *Pulau Bengkalis,* INDONESIA; ca.

1°27′N, 102°18′E; collected 22 Mar. 1906 by W. L. Abbott (field catalog; in Lyon, 1908, p. 623); USNM, 1. FAS; B:SM-6.

Kapuas, Sungai. See Semitau, Sungai Kapuas.

Kapuas, Sungai, right bank, 25 km above mouth; *Borneo: Kalimantan,* INDONESIA; ca. 2°48′S, 114°17′E; observed Jul. 1984–May 1986 by K. M. Burton (see Chivers & Burton, [1991], p. 140). FAS; C:K-24.

Karakit, *Pulau Banggi,* MALAYSIA: SABAH; 7°07′N, 117°05′E; collected 22 Jun. 1991 by Shukor Md. Nor (pers. comm., 17 Jul. 1991); FMNH, 1. FAS; C:Sab-9.

Karangan, Sungai; *Borneo: Kalimantan,* INDONESIA; 1°19′N, 117°55′E; collected 1 Nov. 1913 by H. C. Raven (see Deignan, [1960], p. 269); USNM, 1 (skull only). FAS; C:K-44.

Karangintan, hilly country, Sungai Martapura, 30 ft (= 10 m); *Borneo: Kalimantan,* INDONESIA; 3°26′S, 114°55′E; collected 19 Aug. 1909 by G. C. Shortridge; BM(NH), 1. FAS; C:K-27.

Karanginton. See Karangintan.

Karangmumus, Sungai, near Samarinda; *Borneo: Kalimantan,* INDONESIA; 0°30′S, 117°09′E; collected 3 Jul. 1912 by H. C. Raven (field catalog); USNM, 1. FAS; C:K-49.

Karang Tigan. See Karangtigau, Tanjung.

Karangtigau, Tanjung; *Borneo: Kalimantan,* INDONESIA; 2°26′N, 118°00′E; collected 4 Aug. 1912 by H. C. Raven (field catalog; cf. Deignan, [1960], p. 267); USNM, 2 (including 1 skin only). FAS; C:K-40.

Karawassen. See Kawarasan.

Karimata. See Pai, Teluk; *Pulau Karimata.*

Karimon Anak. See *Karimun-kecil, Pulau.*

Karimon Djawa. See *Karimunjawa, Pulau.*

Karimon-Djawa, Pulau, (P. Kamoedian). See Kemujan, Pulau.

Karimunjawa, Pulau, INDONESIA; 5°50′–5°53′S, 110°25′–110°29′E; collected 7–14 May 1926 by K. W. Dammerman, Denin, and P. F. Franck; MZB, 5 (including 1 skull only). Collected 26–28 Nov. 1930 by W. Romswinckel; MZB, 2; RMNH, 1 (skull not examined). KAR: C:J-27.

Karimun-kecil, Pulau, Kepulauan Riau, INDONESIA; 1°07′–1°10′N, 103°22′–103°25′E; reported present Jun.–Aug. 1903 by W. L. Abbott (see Miller, 1906c, p. 277). FAS; B:SCS-17.

Kariorang; *Borneo: Kalimantan,* INDONESIA; 0°50′N, 117°52′E; collected in 1903 by M. Schmidt; ZMB, 2 (skulls only). FAS; C:K-45.

Kaser Doo Wildlife Sanctuary; BURMA; 13°15′–13°24′N, 98°45′–99°00′E; reported present ca. 1994 (Anonymous, 1994, p. 12). Subspecies uncertain; A:Bu-16.

Kata Taek, ca. 200 m; THAILAND; ca. 15°28′N, 99°23′E; collected 2–3 Mar. 1967 by J. Fooden (1971, p. 17); FMNH, 6. FAS; A:T-19.

Katchal Island. See Ol-kolo-kwák vicinity; *Katchall Island.*

Katchall Island, Nicobar Islands, INDIA; 7°52′–8°02′N, 93°18′–93°27′E; observed before 1847 by P. Barbe (1846, p. 365). UMB; A:N-1.

Kateman, Sungai, < 2 ft (= < 1 m); *Sumatra,* INDONESIA; 0°12′N, 103°20′E; collected 8 Sep. 1903 by W. L. Abbott (in Lyon, 1908, p. 625); USNM, 1 (skull only). FAS; B:S-57.

Kathema Kyun, BURMA; 13°39′N, 98°12′E; collected 20–22 Apr. 1936 by H. C. Smith; BM(NH), 4. AUR; A:Bu-15.

Katingan, Sungai, left bank, 160 km above mouth; *Borneo: Kalimantan,* INDONESIA; ca. 1°47′S, 113°19′E; observed Jul. 1984–May 1986 by K. M. Burton (see Chivers & Burton, [1991], p. 140). FAS; C:K-13.

Katingan, Sungai, left bank, 200 km above mouth; *Borneo: Kalimantan,* INDONESIA; ca. 1°30′S, 113°10′E; observed Jul. 1984–May 1986 by K. M. Burton (see Chivers & Burton, [1991], p. 140). FAS; C:K-14.

Katingan, Sungai, right bank, 140 km above mouth; *Borneo: Kalimantan,* INDONESIA; ca. 2°04′S, 113°25′E; observed Jul. 1984–May 1986 by K. M. Burton (see Chivers & Burton [1991], p. 140). FAS; C:K-11.

Kawarasan; *Java,* INDONESIA; 7°49′S, 112°07′E; collected 20 Apr. 1895 by unknown collector; RMNH, 1 (skin only). FAS; C:J-33.

Kayan, Sungai. See Long Peleben.

Kebun Percobaan Haurbentes, Areal; *Java,* INDONESIA; not located; obseved Oct. 1989 and Jan. 1991 by M. Bismark (1992, p. 11). FAS; not mapped.

Kediri. See Manggis; Margomulio, Gunung.

Kediri district; *Java,* INDONESIA; ca. 7°48′S, 112°15′E; collected 13 Nov. 1910 and 25 Nov. 1911 by V. Arnim; ZSBS, 2 (skulls only; not seen, data from G. H. Albrecht, pers. comm., Oct. 1991). FAS; C:J-33.

Kelabit uplands, 4000 ft. See Dulit, Bukit, 4000 ft.

Kelabong, Bukit, vicinity; *Sumatra,* INDONESIA; ca. 3°13′S, 102°26′E; reported prsent Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). FAS; B:S-67.

Kelang Road, 7.25 km; MALAYSIA: WEST MA-

LAYSIA; ca. 3°05′N, 101°40′E; collected 2 Dec. 1953 by Scrub Typhus Research Unit; BM(NH), 1. FAS; B:WM-19.

Kelapa, Pulau, Lesser Sunda Islands, INDONESIA; 8°39′–8°42′S, 119°13′–119°14′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:e.

Kembangjanggut; *Borneo: Kalimantan,* INDONESIA; 0°08′N, 116°22′E; collected 28 Nov. 1956 by A. M. R. Wegner and Saän; MZB, 1. FAS; C:K-48.

Kemujan, Pulau, INDONESIA; 5°47′–5°51′S, 110°27′–110°30′E; reported present before 1906 by T. Willink (1905, p. 175). Collected 25 Nov. 1930 by W. Romswinckel; MZB, 1 (skull only). KAR; C:J-27.

Kenepai, Gunung. See Roema Manoeal, south foot of Gunung Kenepai.

Keningau, 800 ft (= 250 m); *Borneo,* MALAYSIA: SABAH; 5°20′N, 116°10′E; collected Sep. 1960 by R. E. Kuntz (1969, p. 193); AMNH, 1. FAS; C:Sab-6.

Kenokok, 3300 ft (= 1000 m); *Borneo,* MALAYSIA: SABAH; ca. 6°04′N, 116°28′E; collected 25 Apr. 1929 by F. N. Chasen (1931, p. 6); ZRC, 1. FAS; C:Sab-7.

Kenyam, Sungai, 100 m; MALAYSIA: WEST MALAYSIA; 4°31′N, 102°28′E; observed Jul. 1978–Jun. 1981 by C. W. Marsh and W. L. Wilson (1981, p. 232). FAS; B:WM-11.

Keramat. See Tanjong Tuan, Keramat.

Kerinci. See Sandaran Agong, Kerinci region; Siulakderas, Kerinci region.

Kerinci, Gunung, northern foot; *Sumatra,* INDONESIA; 1°40′S, 101°20′E; observed Jun. 1985–Mar. 1986 by T. Oi (1986, p. 73). FAS; B:S-52.

Keroh Forest Reserve; MALAYSIA: WEST MALAYSIA; ca. 4°13′N, 101°07′E; observed 2 Jun. 1935 by R. C. Morris (1936, p. 440). FAS; B:WM-16.

Kertau, Bukit; MALAYSIA: WEST MALAYSIA; ca. 3°27′N, 102°37′E; examined for malaria 1965–1969 by McW. Warren, W. H. Cheong, H. K. Fredericks, and G. R. Coatney (1970, p. 386). FAS; B:WM-14.

Ketambe, ca. 5 km S; *Sumatra,* INDONESIA; ca. 3°38′N, 97°40′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-13.

Ketambe, ca. 10 km S; *Sumatra,* INDONESIA; ca. 3°36′N, 97°40′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-13.

Ketambe, ca. 30 km SSE; *Sumatra,* INDONESIA; ca. 3°27′N, 97°50′E; reported present before 1981 by M. Borner (Crockett & Wilson, 1980, p. 156). FAS; B:S-14.

Ketambe Research Station, Gunung Leuser National Park, ca. 350 m; *Sumatra,* INDONESIA; 3°40′N, 97°40′E; observed Jun. 1971–Aug. 1974 by H. D. Rijksen (1978, p. 111). Hormonal study Oct.–Nov. 1987 by C. P. van Schaik, M. A. van Noordwijk, T. van Bragt, and M. A. Blankenstein (1991, p. 347). FAS; B:S-13.

"Kg. Baru"; *Sumatra,* INDONESIA; not located (USBGN Gazetteer of Indonesia, 1982, p. 483, lists 2 populated places named "Kampungbaru" in Sumatra), 5°38′N–5°57′S, 95°12′–106°05E; collected in 1906 and 1910 by C. Bruegel; ZSBS, 10 (including 5 skins only, 2 skulls only). FAS; not mapped.

Khangkhao, Ko, THAILAND; 13°06′–13°07′N, 100°48′–100°49′E; reported present 15 Nov. 1990 by local boatman (Aggimarangsee, 1992, pp. 111, 130; pers. comm., Oct. 1993). Subspecies uncertain; A:T-31.

Khao Khieo Wildlife Sanctuary; THAILAND; 13°13′N, 101°04′E; introduced population, released before Jan. 1977, observed Jun. 1977–Jun. 1978 by P. J. Storer (1979, pp. 28, 46). Subspecies uncertain; not mapped.

Khao Lampi-Hat Thai Muang National Park; THAILAND; ca. 8°23′N, 98°20′E; reported present 21–25 Nov. 1987 by local residents (Boonratana, 1988, p. 76). AUR/FAS/MUL; A:T-51.

Khao Naw. See Wat Khao Noh.

Khao Ngu. See Wat Ratch Singkhorn.

Khao Noh. See Wat Khao Noh.

Khao Noi/Khao Tangkuan; THAILAND; 7°13′N, 100°36′E; blood samples taken Aug.–Sep. 1988 by P. Varavudhi, J. Suzuki, U. Yodyingyuad, T. Nootprapand, V. Yodyingyuad, Y. Chaiseha, K. Suwanprasert, and W. Settheetham (1989b, p. 77; cf. Kawamoto et al., 1989, p. 95). Observed 9–14 Apr. 1989 by N. Aggimarangsee (1992, pp. 109, 139; pers. comm., Oct. 1993). FAS; A:T-67.

Khao Noi-Khuo Tanguan. See Khao Noi/Khao Tangkuan.

Khao Paskowee. See Khao Phatowee.

Khao Phatowee; THAILAND; ca. 15°28′N, 99°45′E; observed 25 Feb. 1967 by J. Fooden (1971, p. 16). Observed 1973–1974 by A. A.

Eudey (1979, p. 90; 1994, p. 274). FAS; A:T-22.

Khao Rang Kai, 4 km E. of Ban Palian, 75 m; THAILAND; 7°19′N, 99°48′E; collected 6 Jul. 1973 by J. Fooden ([1975], p. 98); CTNRC, 1; FMNH, 1. FAS; A:T-62.

Khao Sam Muk. See Sammuk, Khao.

Khao Sam Roi National Park; THAILAND; 12°05′–12°17′N, 99°53′–100°02′E; reported present before 1994 by J. W. K. Parr, N. Mahannop, and V. Charoensiri (1993, p. 245). AUR/FAS/MUL; A:T-40.

Khao Suan Luang; THAILAND; 13°35′N, 99°45′E; observed 24 Dec. 1990 by N. Aggimarangsee (1992, pp. 111, 128; pers. comm., Oct. 1993). FAS; A:T-28.

Khao Wang; THAILAND; 13°06′N, 99°56′E; observed 12–13 Aug. 1989 and 9–10 Feb. 1991 by N. Aggimarangsee (1992, pp. 109, 112, 130); pers. comm., Oct. 1993). Subspecies uncertain; A:T-37.

Khram Yai, Ko, THAILAND; 12°40′–12°43′N, 100°45′–100°48′E; collectd 30 Oct. 1916 by C. B. Kloss (1919c, p. 335); BM(NH), 2; USNM, 5; ZRC, 2. Collected 1 Jun. 1917 by W. J. F. Williamson; ZRC, 2. ATR; A:T-39.

Khulna disrict, Sundarbans; BANGLADESH; 22°20′N, 89°27′E; improbable report (Anonymous, 1977, p. 14; cf. Sarker & Sarker, 1984, p. 9; M. A. R. Kahn, 1985, p. 30). Not mapped.

Khwae Noi, Mae Nam, right bank, ca. 10 km below Ban Wang Kalang; THAILAND; ca. 15°03′N, 98°30′E; observed 3 Feb. 1967 by J. Fooden (1971, p. 15). AUR; A:T-20.

Kiambang; *Sumatra,* INDONESIA; 5°27′S, 105°44′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-86.

Kiau. See Garau; Kampong Kiau; Kampong Kiau-Tenampok Pass, trail between; Kiaulan; Tempasuk, Sungai; and Tinonkok.

Kiaulan, Kampong Kiau region, ca. 2200 ft (= 670 m); *Borneo,* MALAYSIA: SABAH; ca. 6°02′N, 116°31′E; collected 17 Aug. 1937 by J. A. Griswold, Jr. (1939b, p. 514); MCZ, 2. FAS; C:Sab-7.

Kinabalu, Mount; *Borneo,* MALAYSIA: SABAH; ca. 6°05′N, 116°33′E; collected 31 May–28 Aug. 1937 by J. A. Griswold, Jr. (1939a, p. 402; 1939b, p. 504); MCZ, 9 (including 6 skulls only, 3 mandibles only). FAS; C:Sab-7.

Kinabalu National Park; *Borneo,* MALAYSIA: SABAH; ca. 6°05′N, 116°35′E; reported present before 1983 by G. Davies ([1983], p. 148). FAS; C:Sab-7.

Kinabatangan, Sungai; *Borneo,* MALAYSIA: SABAH; ca. 5°42′N, 118°23′E; collected 19–23 Dec. 1887 by C. F. Adams (see Medway, 1977, p. 4); USNM, 2 (including 1 skull only). FAS; C:Sab-19.

King's Island. See *Kadan, Kyun.*

Kinta, Daerah (district); MALAYSIA: WEST MALAYSIA; ca. 4°30′N, 101°12′E; collected before 1901 by unknown collector (Flower, 1900, p. 316); specimens reportedly in Taiping Museum (not seen). FAS; B:WM-7.

Klaeng. See Wang Kaew.

Klang Road, 4½ miles. See Kelang Road, 7.25 km.

Klang Straits. See *Pintu Gedong, Pulau.*

Klet Kaeo, Ko, THAILAND; 12°46′N, 100°51′E; trapped spring 1967 by G. Berkson (1970, p. 286). Subspecies uncertain; A:T-39.

Kloet, Goenoeng. See Manggis, Gunung Kelud; Margomulio, Gunung.

Klong Pah Yie; *Ko Samui,* northwest, THAILAND; ca. 9°32′N, 99°57′E; collected 7 May 1913 by H. C. Robinson (1915, p. 129) and E. Seimund; ZRC, 1. FAS; A:T-49.

Klumpang, Teluk; *Borneo: Kalimantan,* INDONESIA; ca. 3°00′S, 116°12′E; observed 8 Jan.–13 Mar. 1908 or 18–19 Apr. 1909 by W. L. Abbott (in Lyon, 1911, p. 58). FAS; C:K-51.

Kode, Nusa, Lesser Sunda Islands, INDONESIA; 8°47′–8°49′S, 119°37′–119°40′E; reported present 1969–1973 by W. Auffenberg (1981, p. 40). FAS; C:LS-13.

Koh Alang Yai. See *Rang Yai, Ko.*

Koh Chang Island. See *Chang, Ko.*

Kohhang. See Pran Buri, Mae Nam, mouth.

Koh Kram Island. See *Khram Yai, Ko.*

Koh Kut Island. See *Kut, Ko.*

Koh Lak. See Prachuap Khiri Khan.

Koh Lang. See *Rang Yai, Ko.*

Koh Naka Yai. See *Naka Yai, Ko.*

Koh Nam Kam. See Nang Kham, Ko.

Koh Pennan. See *Phangan, Ko.*

Koh Piam. See *Phayam, Ko.*

Koh Pipidon. See *Phi Phi Don, Ko.*

Koh Samui. See *Samui, Ko.*

Koh Si Chang. See *Si Chang, Ko.*

Ko Khanghkao. See *Khangkhao, Ko.*

Ko Khangkao. See *Khangkhao, Ko.*

Ko Klet Kaeo. See *Klet Kaeo, Ko.*

Komodo, Pulau, Lesser Sunda Islands, INDONESIA; 8°26′–8°46′S, 119°22′–119°34′E; monkeys reported absent Jul. 1969–Jun. 1970 by W. Auffenberg (1981, p. 242). C:e.

Kopenheat; *Great Nicobar Island,* INDIA; 6°58′N, 93°43′E; collected 23 Mar. 1901 by W. L. Ab-

bott (field catalog; cf. Miller, 1902b, p. 751; Kloss, 1903a, map facing p. 8); USNM, 1 UMB; A:N-3.

Korinchi. See Sandaran Agong.

Ko Sichang. See *Si Chang, Ko.*

Kosumpee. See Kosumphi Forest Park.

Kosumphi Forest Park; THAILAND; 16°15′N, 103°05′E; blood samples taken Aug.–Sep. 1988 by Y. Kawamoto, T. Ishida, J. Suzuki, O. Takenaka, and P. Varavudhi (1989, p. 95). Observed 21 Jul. 1989 and 12 Jan. 1991 by N. Aggimarangsee (1992, pp. 109, 111, 119; pers. comm., Oct. 1993). Subspecies uncertain; A:T-12.

Kosumphisai. See Kosumphi Forest Park.

Kotabumi, Propinsi Lampung, 23 m; *Sumatra,* INDONESIA; 4°50′S, 104°54′E; collected 6 May 1940 by Vogelpol; ZRC, 1. FAS; B:S-81.

Kota Kinabalu. See Papar; Talibang; Tuaran.

Kotapinang. See Telukpanji, Kotapinang region.

Kotawaringin. See Riam, Kotawaringin district.

Kowloon Reservoir Area; UNITED KINGDOM: HONG KONG; ca. 22°21′N, 114°09′E; introduced population, reported present ca. 1967 by P. Marshall (1967, p. 44). Subspecies uncertain; not mapped.

Krakatau, Pulau. See *Rakata, Pulau.*

Krakatau Ketjil, Pulau. See *Rakata-kecil, Pulau.*

Krau Game Reserve. See Kuala Lompat.

Krau River. See Benom, Gunong.

Kretam Besar, Sungai, Kinabatangan district, 70 m; *Borneo,* MALAYSIA: SABAH; 5°32′N, 118°32′E; collected 25 May 1950 by D. D. Davis (1962, p. 11; field catalog); FMNH, 1. FAS; C:Sab-20.

Kretam Kechil, Sungai, Kinabatangan district, 70 m; *Borneo,* MALAYSIA: SABAH; 5°31′N, 118°33′E; collected 13 May 1950 by D. D. Davis (1962, p. 11; field catalog); FMNH, 1. FAS; C:Sab-20.

Kroh Reserve. See Keroh Forest Reserve.

Kuala Belalong Field Studies Centre; *Borneo*; BRUNEI; ca. 4°33′N, 115°08′E; reported present 1991–1992 by Earl of Cranbrook (1993, p. 274). FAS; not mapped (record discovered after Fig. 2C was prepared).

Kuala Binjai. See Binjai, Sungai.

Kuala Indau. See Endau, Sungai, vicinity.

Kuala Lompat; MALAYSIA: WEST MALAYSIA; ca. 3°42′N, 102°17′E; observed 1969–1970 by D. Chivers (1971, p. 80). Observed 1969–1970 by Lord Medway and D. R. Wells (1971, p. 246). FAS; B:WM-15.

Kuala, Lompat, 50 m; MALAYSIA: WEST MALAYSIA; 3°43′N, 102°17′E; observed Jul. 1978–Jun. 1981 by C. W. Marsh and W. L. Wilson (1981, p. 232). Observed Mar. 1984–Oct. 1986 by F. Lambert (1990, p. 455). FAS; B:WM-15.

Kuala Lompat Post, 0–1 km NW; MALAYSIA: WEST MALAYSIA; ca. 3°43′N, 102°17′E; observed Jul.–Dec. 1977 by D. Chivers and G. Davies (1979, p. 19). Observed Jul. 1974–Jan. 1976 by F. P. G. Aldrich-Blake (1980, p. 147). FAS; B:WM-15.

Kuala Lompat Post, 0–2 km W; MALAYSIA: WEST MALAYSIA; ca. 3°42′N, 102°17′E; observed Jul.–Dec. 1977 by D. Chivers and G. Davies (1979, p. 19). FAS; B:WM-15.

Kuala Lumpur. See Nanas, Bukit, Kuala Lumpur.

Kuala Lumpur vicinity; MALAYSIA: WEST MALAYSIA; ca. 3°10′N, 101°42′E; observed 1901–1902 by N. Annandale and H. C. Robinson (see Bonhote, 1903, p. 4). Observed Aug.–Dec. 1970 by C. H. Southwick and F. C. Cadigan, Jr. (1972, p. 13). Observed Jun. 1976–Jul. 1977 by Y. L. Mah and F. P. G. Aldrich-Blake (1980, p. 354). Laboratory animals obtained 1979–1980 by unknown collectors (Burke et al., 1981, p. 928). FAS; B:WM-19.

Kuala Pilah vicinity; MALAYSIA: WEST MALAYSIA; ca. 2°44′N, 102°15′E; examined for malaria before 1994 by A. N. Rain, J. W. Mak, and R. Zamri (1993, p. 386). FAS; B:WM-25.

Kuala Rompin, 5 m; MALAYSIA: WEST MALAYSIA; 2°50′N, 103°26′E; observed Jul. 1978–Jun. 1981 by C. W. Marsh and W. L. Wilson (1981, p. 232). FAS; B:WM-22.

Kuala Selangor, 0–40 m; MALAYSIA: WEST MALAYSIA; 3°21′N, 101°15′E; observed Feb. 1965–Jun. 1966 by I. S. Bernstein (1968b, p. 8). Observed Aug.–Dec. 1970 by C. H. Southwick and F. C. Cadigan, Jr. (1972, p. 10). FAS; B:WM-18.

Kuala Selangor, sea level; MALAYSIA: WEST MALAYSIA; 3°20′N, 101°17′E; reported present before 1973 by B. E. Weber (1972, p. 468). Observed Jul. 1978–Jun. 1981 by C. W. Marsh and W. L. Wilson (1981, p. 232). FAS; B:WM-18.

Kuala Selangor estuary, south bank; MALAYSIA: WEST MALAYSIA; ca. 3°21′N, 101°15′E; observed Mar.–Apr. 1977 by Lim Boon Hock and A. Sasekumar (1979, p. 106). FAS; B:WM-18.

Kuantan; MALAYSIA: WEST MALAYSIA; 3°48′N, 103°20′E; captive obtained ca. 1963 by unspecified collectors (Garnham, 1963, p. 156). FAS; B:WM-13.

Kuatnana, 300 m; *Pulau Timor,* Lesser Sunda Is-

lands, INDONESIA; ca. 9°50′S, 124°10°E; collected 20 Jul. 1911 by C. B. Haniel (see Hellmayr, 1914, p. 5); ZSBS, 1. FAS; C:LS-26.

Kuching; *Borneo,* MALAYSIA: SARAWAK; 1°33′N, 110°20′E; collected 23 Sep. 1893 by unknown collector; SMK, 1. Collected Mar. 1898 by unknown collector; SMK, 1. Collected 25 Jul. 1898 by C. Ulok; SMK, 1 (skin only, skull inside). Collected date unknown by unknown collector; SMK, 2 (skulls only). FAS; C:Sar-4.

Kuching, 10th mile; *Borneo,* MALAYSIA: SARAWAK; ca. 1°33′N, 110°20′E; collected 16 Jan. 1895 by unknown collector; SMK, 1 (skin only, skull inside). FAS; C:Sar-4.

[Kuching, probably]; *Borneo,* MALAYSIA: SARAWAK; 1°33′N, 110°20′E; collected 1865–1866 by G. Doria (see Beccari, 1904, p. 30); ZMB, 1. FAS; C:Sar-4.

Kuda. See Poelau (?= Kuda), Sungai Sibau.

Kukuh; *Pulau Bali,* Lesser Sunda Islands, INDONESIA; ca. 8°31′S, 115°12′E; blood samples taken in 1980 by Y. Kawamoto, K. Nozawa, and Tb. M. Ischak (1981, p. 16). Observed Jul.–Sep. 1993 by M. F. Small (1994, p. 10). FAS; C:LS-3.

Kundur, Pulau, Kepulauan Riau, INDONESIA; 0°38′–0°53′N, 103°21′–103°30′E; reported present Jun.–Aug. 1903 by W. L. Abbott (see Miller, 1906c, p. 279). Collected 19 Aug. 1908 by E. Seimund; ZRC, 2 (skulls only). FAS; B:SCS-17.

Kuprakona. See Wat Koo Pra Kona.

Ku Prakonna. See Wat Koo Pra Kona.

Kut, Ko, THAILAND; 11°33′–11°46′N, 102°32′–102°37′E; collected 23–29 Dec. 1914 by C. B. Kloss (1916b, p. 28); BM(NH), 3; BM(NH) (skull)/ZRC (skin), 1; USNM, 2; ZRC, 1. Collected 1 Jun. 1917 by H. M. Smith (see Riley, 1938, p. 2); USNM, 1. FAS; A:T-36.

Kuta; *Pulau Lombok,* Lesser Sunda Islands, INDONESIA; 8°55′S, 116°17′E; blood samples taken Jan. 1979–Dec. 1981 by Y. Kawamoto (1982, p. 66). FAS; C:LS-6.

Kutai Nature Reserve, northeast corner; *Borneo: Kalimantan,* INDONESIA; ca. 0°30′N, 117°30′E; observed 1 May 1970–31 Jul. 1971 by P. Rodman (1973, p. 655). Observed Oct. 1974–Jun. 1976 by B. P. Wheatley (1978, p. 347). FAS; C:K-46.

Kute. See Kuta.

Kya-eng. See Ataran River.

Labuan Badjan Bay. See Labuhanbajau.

Labuhanbajau; *Pulau Simeulue,* INDONESIA; 2°24′N, 96°28′E; collected 1 Jan. 1902 by W. L. Abbott (see Miller, 1903a, p. 437); USNM, 1. FUS; B:IO-3.

Labuhandeli. See Deli, Sungai, between Belawan and Labuhandeli.

Labuhandeli vicinity; *Sumatra,* INDONESIA; 3°45′N, 98°41′E; collected 1881–1883 by B. Hagen (1890, p. 82); museum unknown, 1 (not seen). FAS; B:S-21.

Labuk Road, Sepilok Forest Reserve; *Borneo,* MALAYSIA: SABAH; ca. 5°53′N, 118°00′E; observed 1968–1969 by M. Kawabe and T. Mano (1972, p. 216). FAS; C:Sab-17.

Lac Giao, 400 m; VIETNAM; 12°40′N, 108°03′E; collected 18 Mar. 1937 by W. H. Osgood (1941, p. 1; field catalog); FMNH, 1. AUR/FAS/MUL; A:V-2.

Lacon. See Nakhon Si Thammarat.

Lacon Stritamarat. See Nakhon Si Thammarat.

La Datu. See Lahad Datu.

Laem Ngop-Phumi Cham Yeam, river between; CAMBODIA or THAILAND; ca. 12°00′N, 102°47′E; observed in 1914 by C. B. Kloss (1916a, p. 32). FAS; A:C-3.

Laem Sing mountains; THAILAND; 12°29′N, 102°04′E; collected 7 Jun. 1926 by H. M. Smith (see Riley, 1938, p. 9); USNM, 1. FAS; A:T-33.

Laem Son National Park; THAILAND; ca. 9°17′N, 98°31′E; observed 25–28 Nov. 1987 by R. Boonratana (1988, p. 76). AUR/FAS/MUL; A:T-46.

Lafau; *Pulau Nias,* INDONESIA; 1°23′N, 97°13′E; collected 24 Mar. 1905 by W. L. Abbott (cf. Lyon, 1916, p. 458); USNM, 1. FAS; B:IO-6.

Lagong, Pulau, INDONESIA; 3°34′–3°38′N, 108°04′–108°08′E; collected 19 Jun. 1900 by W. L. Abbott (see Miller, 1901, p. 111); USNM, 1. FAS; B:SCS-34.

Lahad Datu; *Borneo,* MALAYSIA: SABAH; 5°02′N, 118°19′E; collected 10 Nov. 1903 by Dr. Pagel; ZMB, 1. FAS; C:Sab-21.

Lahat; *Sumatra,* INDONESIA; 3°48′S, 103°32′E; collected in 1875 by unknown collector; NHMBa, 2 (skulls only). FAS; B:S-73.

Lal char; BURMA; ca. 21°05′N, 92°12′E; observed Sep. 1982–Feb. 1983 by M. A. R. Khan and M. A. Wahab (1983, p. 104; cf. M. A. R. Khan, 1985, p. 30). AUR; A:Bu-1.

Lampung. See Wonosobo, Propinsi Lampung.

Lampung, Propinsi (province); *Sumatra,* INDONESIA; ca. 5°10′S, 104°45′E; collected in 1908 by J. Elbert; ZSBS, 1 (skull only). Blood samples taken Jan.–Nov. 1979 by Y. Kawamoto and Tb. M. Ischak (1981, p. 238). FAS; B:S-80.

Lampungs. See Lampung, Propinsi (province).

Lamukotan, Pulau. See *Lemukutan, Pulau.*

Lanbi Kyun, BURMA; 10°42′–10°59′N, 98°02′–98°18′E; collected 30 Jan. 1900 and 6 Jan. 1904 by W. L. Abbott; USNM, 2 (including 1 skull only). AUR; A:Bu-21.

Lancang Kuning; *Pulau Bintan,* Kepulauan Riau, *INDONESIA*; not precisely located, 0°48′–1°13′N, 104°13′–104°34′E; observed 18 Jan.–2 Feb. 1992 by A. Yanuar (1994, p. 2). FAS; B:SCS-8.

Landai vicinity; *Sumatra,* INDONESIA; ca. 0°01′S, 100°37′E; reported Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). FAS; B:S-54.

Landak. See Perbuah, Sungai Landak.

Langgaliroe; *Pulau Sumba,* Lesser Sunda Islands, INDONESIA; not precisely located, 9°17′–10°19′S, 118°57′–120°50′E; collected 24–29 May 1932 by G. Stein; MZB, 2; ZMB, 1. FAS; C:LS-22, LS-23.

Lang Island. See *Rakata-kecil, Pulau.*

Langkawi, Pulau, MALAYSIA: WEST MALAYSIA; 6°15′–6°28′N, 99°38′–99°55′E; collected 10 Feb. 1909 by museum collector (see H. C. Robinson & Kloss, 1910, p. 664; H. C. Robinson, 1917, p. 130); BM(NH), 1. FAS; B:SM-1.

Langkawi, Pulau, 50 m, MALAYSIA: WEST MALAYSIA; 6°15′–6°28′N, 99°38′–99°55′E; observed Jul. 1978–Jun. 1981 by C. W. Marsh and W. L. Wilson (1981, p. 232). FAS; B:SM-1.

Langkoe. See *Langkoi, Pulau.*

Langkoi, Pulau, Lesser Sunda Islands, INDONESIA; 8°44′S, 119°22′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:e.

Lanjak-Entimau Orang-Utan Sanctuary (proposed); *Borneo,* MALAYSIA: SARAWAK; ca. 1°30′N, 112°05′E; observed Aug.–Nov. 1981 by Sarawak Forest Department—World Wildlife Fund team (Kavanagh, 1982, p. 320). FAS; C:Sar-11.

Lankawi, P. See *Langkawi, Pulau.*

Lanta Yai, Ko, THAILAND; 7°28′–7°41′N, 99°02′–99°08′E; collected 9–12 Jan. 1917 by H. C. Robinson and E. Seimund (H. C. Robinson, 1917, p. 135); museum unknown, 1 (not seen). FAS; A:T-55.

Larut, Daerah (district); MALAYSIA: WEST MALAYSIA; ca. 4°55′N, 100°47′E; collected before 1901 by unknown collector (Flower, 1900, p. 316); specimens reportedly in Taiping Museum (not seen). FAS; B:WM-5.

Lasia, Pulau, INDONESIA; 2°08′–2°12′N, 96°37′–96°40′E; collected 4–5 Jan. 1902 by W. L. Abbott (see Miller, 1903a, p. 438); USNM, 2. LAS; B:IO-4.

Lat Bua Kao. See Lat Bua Khao, Sathani.

Lat Bua Khao, Sathani; THAILAND; 14°52′N, 101°36′E; collected 10 Oct 1916 by C. B. Kloss (1919c, p. 335); USNM, 1; ZRC, 1. FAS; A:T-9.

Laut, Pulau, INDONESIA; 4°40′–4°46′N, 107°56′–108°02′E; collected Jul. 1894 by C. Hose; BM(NH), 1 (skin only). Collected 9 Aug. 1900 by W. L. Abbott (see Miller, 1901, p. 111); USNM, 1. FAS; B:SCS-31.

Lauttador; *Sumatra,* INDONESIA; 3°18′N, 99°15′E; collected 1897–1899 by G. Schneider (1905, p. 72); museum and number of specimens unknown (not seen). FAS; B:S-23.

Laut Tawar, Danau. See Bur ni Bebuli.

Lawadarat, Gili, Lesser Sunda Islands, INDONESIA; 8°28′–8°29′S, 119°33′–119°34′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:d.

Lawalaut, Gili, Lesser Sunda Islands, INDONESIA; 8°27′–8°28′S, 119°33′–119°35′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:d.

Lelogama, 845 m; *Pulau Timor,* Lesser Sunda Islands, INDONESIA; 9°44′S, 123°57′E; collected 22 May–3 Jun. 1911 by C. B. Haniel (see Hellmayr, 1914, p. 5); ZSBS, 6 (includes 3 skins only); FAS; C:LS-26.

Lem Sing Mts. See Laem Sing mountains.

Lemukutan, Pulau, INDONESIA; 0°43′–0°47′N, 108°42′–108°44′E; reported present 7–10 May 1907 by W. L. Abbott (in Lyon, 1911, p. 59). FAS; B:SCS-24.

Lengah, Pulau, Lesser Sunda Islands, INDONESIA; 8°41′S, 119°28′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:e.

Lesong, 100 m; MALAYSIA: WEST MALAYSIA; 2°44′N, 103°09′E; reported as probably present Jul. 1978–Jun. 1981 by C. W. Marsh and W. L. Wilson (1981, p. 232). FAS; B:WM-21.

Lesten, Daerah Istimewa Aceh, 700 m; *Sumatra,* INDONESIA; 4°10′N, 97°40′E; collected 19 Mar. 1937 by A. Hoogerwerf (1941, p. 7; cf. Chasen, 1940b, p. 485); MZB, 1. FAS; B:S-11.

Letsok-aw Kyun, BURMA; 11°27′–11°48′N, 98°10′–98°20′E; collected 26 Jan. 1904 by W. L. Abbott; USNM, 1 (skin and mandible only). AUR; A:Bu-20.

Leuser, Gunung. See Gunung Leuser Reserve.

Lhokseumawe, ca. 80 km ESE; *Sumatra,* INDONESIA; ca. 4°55′N, 97°48′E; reported present Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). FAS; B:S-10.

Liang Koeboeng; *Borneo: Kalimantan,* INDONESIA; 0°37′N, 113°08′E; collected 10–18 Apr. 1894 by J. Büttikofer (1897, p. 16); RMNH, 2 (see Jentink, 1897, p. 39, who also lists a third specimen). FAS; C:K-16.

Lima Belas Estate, ca. 50–120 m; MALAYSIA: WEST MALAYSIA; ca. 3°46′N, 101°21′E; observed Jul. 1965–Jun. 1966 by I. S. Bernstein (1967, p. 199). Observed Jan. 1980–May 1981 by J. O. Caldecott (1986b, p. 21). FAS; B:WM-18.

Lima Blas Estate. See Lima Belas Estate.

Linga Island. See *Lingga, Pulau.*

Lingartjati. See Linggajati.

Lingga; *Borneo,* MALAYSIA: SARAWAK; 1°21′N, 111°10′E; collected Nov. 1899 by museum collectors; SMK, 2 (skins only, skulls inside). FAS; C:Sar-8,

Lingga, Pulau, INDONESIA; 0°02′N–0°22′S, 104°26′–105°00′E; collected 23 Jul. 1899 by W. L. Abbott (see Miller, 1900, p. 242; 1906c, p. 284; Kloss, 1903b, p. 54); USNM, 2. FAS; B:SCS-13.

Linggajati, Cirebon district, 600 m; *Java,* INDONESIA; 6°52′S, 108°28′E; collected 3 Jan. 1933 by J. J. Menden; AMNH, 1. FAS; B:J-23.

Linglung, Pulo. See *Lagong, Pulau.*

Lingung, Pulo. See *Lagong, Pulau.*

Little Andaman Island, INDIA; 10°31′–10°54′N, 92°22′–92°36′E; primates reported absent before 1903 by G. S. Miller, Jr. (1902b, p. 792; cf. Kloss, [1928], p. 802; Chaturvedi, 1980, p. 134). A:h.

Little Condor Island. See Ben Dam.

Little Durian. See *Durian-kecil, Pulau.*

Little Jolly Boy Island, Andaman Islands, INDIA; 11°31′–11°32′N, 92°36′–92°37′E; primates reported absent before 1903 by G. S. Miller, Jr. (1902b, p. 792; cf. Kloss, [1928], p. 802; Chaturvedi, 1980, p. 134). A:f.

Little Karimon. See *Karimun-kecil, Pulau.*

Little Kretam River. See Kretam Kechil, Sungai.

Little Nicobar Island, INDIA; 7°13′–7°25′N, 93°37′–93°45′E; observed before 1847 by P. Barbe (1846, p. 365). Collected 25–27 Feb. 1901 by W. L. Abbott (see Miller, 1902b, p. 751; Kloss, 1903a, pp. 122, 128); USNM, 3. UMB; A:N-2.

Little Tenasserim River. See Thagyet, Little Tenasserim River.

Loa Bambam; *Borneo: Kalimantan,* INDONESIA; 0°29′S, 117°02′E; collected 1–15 Jun. 1912 by H. C. Raven (see Deignan, [1960], p. 267); USNM, 2 (including 1 skull only; third specimen listed in field catalog). FAS; C:K-49.

Lo Bon Bon. See Loa Bambam.

Loeboe; *Sumatra,* central, INDONESIA; not located, 5°38′N–5°57′S, 95°12′–106°05′E; observed 1877–1879 by J. F. Snelleman (1887, p. 10). FAS; not mapped.

Loeboek Linggan. See Lubuklinggau.

Loeboek Sikaping. See Lubuksikaping.

Logo. See *Lengah, Pulau.*

Loho Gringgo. See Ginggo, Teluk.

Loka; *Pulau Sulawesi,* INDONESIA; ca. 5°26′S, 119°54′E; introduced, reported present 21 Oct.–15 Nov. 1888 by Malay hunters employed by M. Weber (1890a, p. vii; 1890b, p. 102). Subspecies uncertain; not mapped.

Lokan, Sungai; *Borneo,* MALAYSIA: SABAH; ca. 5°32′N, 117°33′E; observed 1969–1970 by P. S. Rodman (1991, p. 359). FAS; C:Sab-15.

Lomblen, Pulau, Lesser Sunda Islands, INDONESIA; 8°11′–8°35′S, 123°13′–123°55′E; *M. fascicularis* reported absent before 1937 by J. J. M. F. Symons (Mertens, 1936, p. 319). C:f.

Lombok, Pulau, Lesser Sunda Islands, INDONESIA; 8°13′–8°58′S, 115°50′–116°43′E; reported present before 1848 by H. Zollinger (1847, p. 203). Reported present May–Jul. 1896 by A. Everett (in Hartert, 1896, p. 593). Purchased ca. 1920 by W. G. Wallace; BM(NH), 1 (skull only). FAS; C:LS-5 through LS-7.

Lompat, Sungai, ca. 3 km ENE of Kuala Serloh; MALAYSIA: WEST MALAYSIA; ca. 3°41′N, 102°11′E; observed Jul.–Dec. 1977 by D. Chivers and G. Davies (1979, p. 20). FAS; B:WM-15.

Lompat, Sungai, ca. 3 km W of Kuala Lompat Post; MALAYSIA: WEST MALAYSIA; ca. 3°42′N, 102°16′E; observed Jul.–Dec. 1977 by D. Chivers and G. Davies (1979, p. 20). FAS; B:WM-15.

Lompat, Sungai, ca. 4 km ENE of Kuala Serloh; MALAYSIA: WEST MALAYSIA; ca. 3°41′N, 102°12′E; observed Jul.–Dec. 1977 by D. Chivers and G. Davies (1979, p. 20). FAS; B:WM-15.

Lompat, Sungai, ca. 4 km W of Kuala Lompat Post; MALAYSIA: WEST MALAYSIA; ca. 3°42′N, 102°15′E; observed Jul.–Dec. 1977 by D. Chivers and G. Davies (1979, p. 20). FAS; B:WM-15.

Lompat, Sungai, ca. 6 km W of Kuala Lompat

Post; MALAYSIA: WEST MALAYSIA; ca. 3°42′N, 102°14′E; observed Jul.–Dec. 1977 by D. Chivers and G. Davies (1979, p. 20). FAS; B:WM-15.

Long Ekang; *Borneo,* MALAYSIA: SARAWAK; 3°55′N, 114°27′E; collected 26 Feb. 1956 by T. A. Chavasse (see Arnold, 1959, p. 204); FMNH, 1. FAS; C:Sar-19.

Long Ikang. See Long Ekang.

Longo, Pulau. See *Longos, Nusa.*

Longos, Nusa, Lesser Sunda Islands, INDONESIA; 8°20′–8°21′S, 120°07′–120°09′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:d.

Long Pangian (?= Long Pangean); *Borneo: Kalimantan,* INDONESIA; 2°42′N, 116°42′E; collected 24 Apr. 1914 by C. Lumholtz (see Gyldenstolpe, 1920, pp. 3, 14–15); Zoological Museum, Christiana, 1 (not examined). FAS; C:K-38.

Long Pelban. See Long Peleben.

Long Peleben; *Borneo: Kalimantan,* INDONESIA; 2°47′N, 116°35′E; collected 30 Jun. 1935 by V. von Plessen (1936, p. 100; cf. Stresemann, 1938, p. 110); AMNH, 1; MZB, 1. Collected Aug. 1956 by P. Pfeffer; MNHN, 1 (skull only). FAS; C:K-38.

Lontar, Pulau. See Lanta Yai, Ko.

Lopburi. See Sarn Pra Karn, Lopburi.

Lower Taipo Road, Kowloon Reservoir Area; UNITED KINGDOM: HONG KONG; ca. 22°21′N, 114°09′E; introduced population, observed Jul.–Aug 1980 and Jul.–Aug. 1981 by C. H. Southwick and K. L. Southwick (1983, p. 19). Subspecies uncertain; not mapped.

Luang Ko. See *Rang Yai, Ko.*

Lubuklinggau, ca. 15 km N; *Sumatra,* INDONESIA; ca. 3°10′S, 102°50′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-64.

Lubuklinggau, ca. 40 km NNW; *Sumatra,* INDONESIA; ca. 2°58′S, 102°43′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-65.

Lubuklinggau, ca. 60 km SE; *Sumatra,* INDONESIA; ca. 3°40′S, 103°15′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-72.

Lubuklinggau, sea level; *Sumatra,* INDONESIA; 3°18′S, 102°52′E; collected 21 Nov. 1933 by J. J. Menden; AMNH, 1. FAS; B:S-64.

Lubuklinggau vicinity; *Sumatra,* INDONESIA; ca. 3°18′S, 102°52′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-64.

Lubukminturun area; *Sumatra,* INDONESIA; ca. 0°52′S, 100°23′E; blood samples taken Jan. 1979–Dec. 1981 by Y. Kawamoto (1982, p. 67). FAS; B:S-47.

Lubuksikaping; *Sumatra,* INDONESIA; 0°08′N, 100°10′E; collected 1 Aug. 1930 by E. Jacobson; RMNH, 1 (skull only). FAS; B:S-43.

Lumu Lumu, 6000 ft (= 1830 m); *Borneo,* MALAYSIA: SABAH; ca. 6°02′N, 116°35′E; captives acquired Jun. 1932 by J. A. Griswold, Jr. (1939b, p. 506). FAS; C:Sab-7.

Lungmanis Station, Sungai Segaliud; *Borneo,* MALAYSIA: SABAH; ca. 5°40′N, 117°45′E; observed in 1958 by K. Stott, Jr. (1964, p. 13). FAS; C:Sab-16.

Macarah [?= Moearah] Doewa. See Muaradua.

MacRitchie Reservior Nature Reserve; *Singapore Island*; SINGAPORE; ca. 1°21′N, 103°50′E; reported present before 1974 by S. H. Chuang (1973, p. 3). FAS; B:SCS-7.

Madgalengka. See Majalengka.

Madura, Pulau, INDONESIA; 6°52′–7°15′S, 112°41′–114°07′E; reported present before 1901 by A. G. Vorderman (1900, p. 143). FAS; C:J-39.

Maenam Chao Phaya. See Chao Phraya, Mae Nam, below Bangkok.

Mae Nam Khwae Noi. See Khwae Noi, Mae Nam.

Mahakam, Sungai, left bank, 1 km above Sebulu; *Borneo: Kalimantan,* INDONESIA; ca. 0°16′S, 117°00′E; observed 29–30 Aug. 1983 by S. Azuma, A. Suzuki, and Y. Ruhiyat (1984, p. 48). FAS; C:K-49.

Mahakam, Sungai, left bank, 4 km above Sebulu; *Borneo: Kalimantan,* INDONESIA; ca. 0°17′S, 116°58′E; observed June 1972 by C. L. Darsono (see Wilson & Wilson, 1975, p. 257). Observed 29–30 Aug. 1983 by S. Azuma, A. Suzuki, and Y. Ruhiyat (1984, p. 48). FAS; C:K-49.

Mahakam, Sungai, north bank, above Samarinda; *Borneo: Kalimantan,* INDONESIA; ca. 0°30′S, 117°05′E; collected 31 May 1912 by H. C. Raven (field catalog); USNM, 1. FAS; C:K-49.

Mahakam, Sungai, right bank, 2 km below Sebulu; *Borneo: Kalimantan,* INDONESIA; ca. 0°17′S, 117°00′E; observed 29–30 Aug. 1983 by S. Azuma, A. Suzuki, and Y. Ruhiyat (1984, p. 48). FAS; C:K-49.

Mahakam, Sungai, right bank, 8 km above Sebulu; *Borneo: Kalimantan,* INDONESIA; ca. 0°18′S, 116°57′E; observed 29–30 Aug. 1983 by S. Azu-

ma, A. Suzuki, and Y. Ruhiyat (1984, p. 48). FAS; C:K-49.

Mahasarakham. See Kosumphi Forest Park.

Majalengka, Cirebon district, 600 m; *Java,* INDONESIA; 6°50′S, 108°13′E; collected 22 Dec. 1932 by J. J. Menden; AMNH, 3. FAS; B:J-22.

Malabar, Pengalengan district, 6000 ft (= 1800 m); *Java,* INDONESIA; 7°07′S, 107°36′E; collected in 1937 by D. P. Bosscha Erdbrink; ZLUU, 1 (skull only). FAS; B:J-6.

Malacca. See Melaka.

Malakka. See Melaka.

Malang. See Wonokojo (?= Wonokerto), Dampit district, southern Malang region.

Malawali, Pulau, MALAYSIA: SABAH; 7°01′–7°05′N, 117°16′–117°22′E; observed Feb.–Jun. 1991 by Shukor Md. Nor (pers. comm., 20 Jul. 1991). FAS; C:Sab-11.

Malaya. See MALAYSIA: WEST MALAYSIA.

MALAYSIA: WEST MALAYSIA; 1°16′–6°43′N, 100°07′–104°18′E; collected date unknown by unknown collector; USNM, 1. FAS; not mapped.

Maliangin Besar, Pulau, MALAYSIA: SABAH; 7°04′–7°05′N, 117°02′–117°03′E; observed Feb.–Jun. 1991 by Shukor Md. Nor (pers. comm., 20 Jul. 1991). FAS; C:Sab-9.

Maliwun. See Pakchan River, near Maliwun.

Maman; *Pulau Sumbawa,* Lesser Sunda Islands, INDONESIA; ca. 8°37′S, 117°29′E; blood samples taken Jul. 1981–Jan. 1982 by Y. Kawamoto, Tb. M. Ischak, and J. Supriatna (1982a, p. 58). FAS; C:LS-8.

Mandalay. See Irrawaddy River, right bank, northwest of Mandalay.

Mandau, Sungai; *Sumatra,* INDONESIA; ca. 0°48′N, 101°47′E; observed ca. 1907 by M. Moszkowski (1909, p. 143, map following p. 192). FAS; B:S-42.

Mandiri River. See Bantargebang.

Manggis, Gunung Kelud, Kediri district; *Java,* INDONESIA; 7°49′S, 112°14′E; collected in 1909 by V. Arnim; ZSBS, 9 (skulls only). FAS; C:J-33.

Mangiatan, Pulau, Lesser Sunda Islands, INDONESIA; 8°33′S, 119°41′E; reported present 1969–1973 by W. Auffenberg (1981, p. 40). FAS; C:LS-13.

Maninjau; *Sumatra,* INDONESIA; 0°18′S, 100°14′E; collected Mar.–Sep. 1888 by M. Weber (1890a, p. iii; 1890b, p. 102); museum unknown, 1 (skeleton only; not seen). FAS; B:S-45.

Mansalar, Pulo. See *Mursala, Pulau.*

Mao Marroe, 450 m; *Pulau Sumba,* Lesser Sunda Islands, INDONESIA; 9°58′S, 120°30′E; collected 4–10 May 1925 by P. F. Franck and Denin (see Dammerman, 1926a, p. 91); MZB, 3. FAS; C:LS-23.

Mapor, Pulau. See Mentigi.

Marah. See Merah.

Maratua, Pulau, INDONESIA; 2°10′–2°19′N, 118°33′–118°39′E; collected 21 May 1913 by H. C. Raven (in Riley, 1930, p. 2); USNM, 4. TUA; C:K-41.

Margo-Molio, Gunung. See Margomulio, Gunung.

Margomulio, Gunung, Gunung Kelud group, Kediri district; *Java,* INDONESIA; 7°55′S, 112°15′E; collected Aug. 1909 by V. Arnim; ZSBS, 1 (skull only). FAS; C:J-33.

Masalembu Besar, Pulau, INDONESIA; 5°32′–5°36′S, 114°24′–114°27′E; monkeys reported absent 4–6 Dec. 1907 by W. L. Abbott (in Lyon, 1911, p. 61). C:b.

Mata, Pulo. See *Matak, Pulau.*

Matak, Pulau, INDONESIA; 3°13′–3°23′N, 106°14′–106°18′E; observed 24 Aug.–5 Sep. 1899 by W. L. Abbott (in Miller, 1900, p. 245; cf. Kloss, 1903b, p. 72). FAS; B:SCS-30.

Matasiri, Pulau, east coast; INDONESIA; ca. 4°47′S, 115°50′E; collected 8 Dec. 1907 and 1907–1908 by W. L. Abbott (field catalog; in Lyon, 1911, p. 61); USNM, 2 (including 1 skull only). FAS; C:K-53.

Maung district. See Phu Phan, Maung district.

Mauritius Island, MAURITIUS; 19°59′–20°31′S, 57°18′–57°48′E; introduced population, observed 19 Apr. 1753 by M. l'Abbe de la Caille (1763, p. 230). Collected before 1862 by E. Newton; BM(NH), 1. Collected 20 Jul. 1875 by J. Audebert; RMNH, 1 (skin only, skull inside). Collected before 1910 by Franco-British Commission; BM(NH), 1. Collected before 1956 by unknown collector; BM(NH), 1 (skull only). Observed 1977–1984 by R. W. Sussman and I. Tattersall (1986, p. 34). Blood samples taken Oct. 1989 by M. Kondo, Y. Kawamoto, K. Nozawa, K. Matsubayashi, T. Watanabe, O. Griffiths, and M.-A. Stanley (1993, p. 168). Subspecies uncertain; not mapped.

Mbarapu, Nusa, Komodo area, Lesser Sunda Isands, INDONESIA; 8°37′S, 119°32′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:e.

Mbura; *Pulau Flores,* Lesser Sunda Islands, INDONESIA; 8°34′S, 119°52′E; collected 17 Oct. 1929 by J. K. de Jong; MZB, 4. FAS; C:LS-13.

Medan, ca. 20 km N; *Sumatra,* INDONESIA; ca. 3°47′N, 98°42′E; observed Nov. 1971–Jan. 1973

by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-21.

Medan, ca. 75 km NW; *Sumatra,* INDONESIA; ca. 4°04′N, 98°09′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-19.

Medan, ca. 100 km SSW; *Sumatra,* INDONESIA; ca. 2°45′N, 98°18′E; reported present before 1981 by H. D. Rijksen (Crockett & Wilson, 1980, p. 156). FAS; B:S-26.

Medan, ca. 105 km SSE; *Sumatra,* INDONESIA; ca. 2°40′N, 98°42′E; reported present Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). FAS; B:S-28.

Medan, forest near; *Sumatra,* INDONESIA; ca. 3°35′N, 98°40′E; collected in 1906 by C. Bruegel; ZSBS, 1. FAS; B:S-21.

Medan, near sea level; *Sumatra,* INDONESIA; 3°35′N, 98°40′E; collected in 1905 by C. Bruegel, ZSBS, 1 (skin only). Collected 1906–1910 by C. Widnmann; ZSBS, 78 (including 41 skins only, 3 skulls only). Collected 21 May 1939 by F. Ulmer (in Miller, 1942, p. 127; cf. Schauensee & Ripley, 1940a, p. 316); ANSP, 1. Collected date unknown by Mrs. P. W. Cremer-Jansen; MCZ, 1 (skull only). FAS; B:S-21.

Medan-Siantar; *Sumatra,* INDONESIA; ca. 3°35′N, 98°40′E; observed Mar.–May 1939 by F. A. Ulmer, Jr. (in Miller, 1942, p. 127). FAS; B:S-21.

Medan vicinity; *Sumatra,* INDONESIA; ca. 3°35′N, 98°40′E; reported present Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). FAS; B:S-21.

Melaka; MALAYSIA: WEST MALAYSIA; 2°12′N, 102°15′E; collected 1818–1863 by P. Diard; RMNH, 1 (skin only). Collected before 1849 by M. de Montigny; MNHM, 2 (skins only, skulls inside). Reported present before 1852 (Anonymous, 1851, p. 444). Collected before 1876 by Gerrard; BM(NH), 1. Collected in 1875 by Schneider; RMNH, 2 (including 1 skin only, skull inside). FAS; B:WM-26.

Melinau Gorge, rock shelter near RGS Camp 5, Mulu National Park, ca. 200 m; *Borneo,* MALAYSIA: SARAWAK; 4°08′N, 114°54′E; collected 24 Aug. 1977 by Lord Medway; BM(NH), 1 (mandibular fragment only). FAS; C:Sar-21.

Meloewak. See Goenoengsetan-Meloewak.

Mempura; *Sumatra,* INDONESIA; 0°43′N, 101°59′E; collected ca. 1907 by M. Moszkowski (1909, p. 151); ZMB, 2 (skulls only). FAS; B:S-42.

Menam; *Sumatra,* INDONESIA; not located, 5°38′N–5°57′S, 95°12′–106°05′E; collected 25 Jul. 1928 by W. Comberg; ZMB, 1 (skin only). FAS; not mapped.

Mendawai, Sungai. See Katingan, Sungai.

Mendit; *Java,* INDONESIA; ca. 8°00′S, 112°50′E; clinical examination in 1980 by K. Matsubayashi and D. Sajuthi (1981, p. 48). FAS; C:J-36.

Mengjatan, Pulau. See *Mangiatan, Pulau.*

Mensuda Bay; *Pulau Karimun,* northeast, Kepulauan Riau, INDONESIA; 1°07′N, 103°23′E; collected 29 May 1903 by W. L. Abbott (field catalog; cf. Miller, 1906c, p. 277); USNM, 1. FAS; B:SCS-17.

Mentarang, Sungai. See Sungai Kayan-Sungai Mentarang Nature Reserve.

Mentigi; *Pulau Mapur,* west, Kepulauan Riau; INDONESIA; ca. 1°00′N, 104°48′E; collected 6 Jun. 1915 by H. C. Robinson (1916, p. 62); ZRC, 1. FAS; B:SCS-9.

Mentoko Research Center, Kutai National Park, ca. 50 m; *Borneo: Kalimantan,* INDONESIA; 0°24′N, 117°06′E; observed Jun. 1982–Sep. 1983 by L. Berenstain (1986, p. 258). FAS; C:K-47.

Menyala, Sungai; MALAYSIA: WEST MALAYSIA; ca. 2°29′N, 101°55′E; collected in 1972 by unknown collector; Department of Anatomy, Cambridge, 1 (in fluid; not seen, data from P. H. Napier, 1981, p. 14). FAS; B:WM-24.

Me Ping River. See Ping, Mae Nam.

Merah; *Borneo: Kalimantan,* INDONESIA; 0°50′N, 116°48′E; collected 25 Nov. 1925 by Madzoed; MZB, 1. FAS; C:K-43.

Mergui; BURMA; 12°26′N, 98°36′E; collected before 1857 by Prof. Oldham; BM(NH), 1 (skull only). Collected 25 Dec. 1881 by J. Anderson, ZSI, 1 (skin only). Collected 1 Mar. 1914 by G. C. Shortridge (in Wroughton, 1915, p. 696); BNHS, 1. AUR; A:Bu-18.

Meru, Gunung; *Sumatra,* INDONESIA; ca. 1°06′S, 100°27′E; 2 troops observed 21 Jun.–28 Oct. 1980 by N. Koyama, A. Asuan, and N. Natsir (1981, p. 1). Observed 27 Aug. 1984–5 Jan. 1985 by N. Koyama (1985, p. 106). FAS; B:S-47.

Meru Betiri Nature Park; *Java,* INDONESIA; ca. 8°28′S, 113°48′E; observed 24 Aug.–14 Sep. 1971 by A. Hoogerwerf (1974, p. 13). Observed in 1976 by J. Seidensticker (1983, p. 324). FAS; C:J-35.

Meulaboh, ca. 35 km NW; *Sumatra,* INDONESIA; ca. 4°21′N, 95°54′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-2.

Meulaboh, ca. 60 km NW; *Sumatra,* INDONESIA; ca. 4°30′N, 95°44′E; observed Nov. 1971–

Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-3.

Meulaboh vicinity; *Sumatra,* INDONESIA; ca. 4°09′N, 96°08′E; reported present Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). FAS; B:S-1.

Mewong River. See Wong, Nam Mae.

Mibya Kyun, mouth of Tavoy River, BURMA; 13°36′N, 98°12′E; collected 23 Apr. 1936 by H. C. Smith; BM(NH), 2. AUR; A:Bu-15.

Middle Andaman Island, INDIA; 12°05′–12°54′N, 92°42′–93°00′E; primates reported absent before 1928 by C. B. Kloss ([1928], p. 802; cf. Chaturvedi, 1980, p. 134). A:b.

Miri; *Borneo,* MALAYSIA: SARAWAK; 4°23′N, 113°59°E; collected Jun. 1890 by E. Hose and C. Hose; MCZ, 1 (skin only, skull inside). Collected date unknown by unknown collector; Duckworth Laboratory of Physical Anthropology, Cambridge, 1 (skull and limb bones only; not seen, data from P. H. Napier, 1981, p. 14). FAS; C:Sar-18.

Miri, Sungai; *Borneo,* MALAYSIA: SARAWAK; ca. 4°23′N, 113°58′E; collected date unknown by unknown collector; Duckworth Laboratory of Physical Anthropology, Cambridge, 1 (skeleton only; not seen, data from P. H. Napier, 1981, p. 14). FAS; C:Sar-18.

Miri district, Batang Baram; *Borneo,* MALAYSIA: SARAWAK; ca. 4°23′N, 113°59′E; collected Jan. 1895 by C. Hose; NHMBe, 1 (skin only). FAS; C:Sar-18.

Misa, Pulau, Lesser Sunda Islands, INDONESIA; 8°31′S, 119°45′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:d.

Mobur, Pulo. See *Mubur, Pulau.*

Moeara Tewech. See Kampong Hadjak, Muaratewe district.

Moera Tewe. See Kampong Hadjak, Muaratewe district.

Moeria, Mt. See Pangonan, Gunung Muria.

Moeriah. See Pangonan, Gunung Muria.

Mokut. See Kampong Mukut.

Monos; *Pulau Karimun,* Kepulauan Riau; INDONESIA; 1°08′N, 103°23′E; collected 29–30 Aug. 1908 by H. C. Robinson (in Thomas & Wroughton, 1909b, pp. 105, 107; cf. H. C. Robinson & Kloss, 1914, p. 394) and E. Seimund; BM(NH), 2. FAS; B:SCS-17.

Morib; MALAYSIA: WEST MALAYSIA; ca. 3°50′N, 100°50′E; examined for malaria before 1994 by A. N. Rain, J. W. Mak, and R. Zamri (1993, p. 386). FAS; B:WM-17.

Moro Batin; *Sumatra,* INDONESIA; 5°26′S, 105°06′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-82.

Moro Batin, south-southeast; *Sumatra,* INDONESIA; ca. 5°35′S, 105°10′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-82.

Moro Besar. See *Durian, Pulau.*

Moro Kechil. See *Durian-kecil, Pulau.*

Moscos Island Game Sanctuary; *Moscos Islands,* BURMA; 13°47′–14°27′N, 97°47′–97°56′E; reported present 1938–1939 by H. A. Maxwell (see Yin, 1954, p. 281). AUR; A:Bu-12.

Mota, Gili. See *Motang, Gili.*

Motang, Gili, Lesser Sunda Islands, INDONESIA; 8°48′–8°49′S, 119°46′–119°48′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:e.

Moulmein. See Ye Forest, Ataran district, Moulmein region.

Moyo, Pulau, Lesser Sunda Islands, INDONESIA; 8°09′–8°23′S, 117°29′–117°42′E; blood samples taken Jan. 1979–Dec. 1981 by Y. Kawamoto (1982, p. 67). FAS; C:LS-9.

Mrengoo Island. See *Myengun Kyun.*

Mt. Setan-Meloewak. See Goenoengsetan-Meloewak.

Mt. Sontra. See Sontra Peak.

Muaradua, Palembang district, 100 m; *Sumatra,* INDONESIA; ca. 4°32′S, 104°05′E; collected 10–17 Jun. 1934 by J. J. Menden; AMNH, 8. FAS; B:S-76.

Muaratewe, Sungai Barito, 65 ft (= 20 m); *Borneo: Kalimantan,* INDONESIA; 0°57′S, 114°53′E; collected 21 Sep. 1909 by G. C. Shortridge; BM(NH), 3 (including 1 skin only). FAS; C:K-32.

Muaratewe vicinity; *Borneo: Kalimantan,* INDONESIA; ca. 0°57′S, 114°53′E; observed 1979–1986 by J. Marshall, D. J. Chivers, and K. M. Burton (see Chivers & Burton, [1991], p. 141). FAS; C:K-32.

Muara Teweh. See Muaratewe.

Muara Tua, Pulo. See *Maratua, Pulau.*

Mubur, Pulau, INDONESIA; 3°18′–3°23′N, 106°10′–106°14′E; observed 24 Aug.–5 Sep. 1899 by W. L. Abbott (in Miller, 1900, p. 245; cf. Kloss, 1903b, p. 72). FAS; B:SCS-30.

Mugitriman, Hak Pegusahaan Hutan (HPH), Jambi; not located; *Sumatra,* INDONESIA; observed Mar. 1989 by M. Bismark (1992, p. 11). FAS; not mapped.

Muk, Ko, THAILAND; 7°22′N, 99°18′E; observed

4–8 Jan. 1917 by H. C. Robinson and E. Seimund (H. C. Robinson, 1917, p. 134). FAS; A:T-56.

Mu Ko Phetra National Park; THAILAND; ca. 6°57′N, 99°42′E; observed 21–23 Dec. 1987 by R. Boonratana (1988, pp. 76, 81); also observed on unspecified adjacent islands. FAS; A:T-57.

Mulu, Gunong. See Gunong Mulu National Park.

Mulu, Gunung, 2000 ft (= 600 m); *Borneo,* MALAYSIA: SARAWAK; 4°03′N, 114°56′E; collected Oct. 1893 by C. Hose; BM(NH), 1 (skull only). FAS; C:Sar-21.

Muntia, Pulau. See Muk, Ko.

Muntok; *Pulau Bangka,* INDONESIA; 2°04′S, 105°10′E; collected in 1900 by A. A. W. Hubrecht ([1895], pp. 33, 88; cf. Kohlbrugge, 1902, p. 322; Zuckerman, [1933], p. 1062); ZLUU, unspecified portion of Pulau Bangka collection (see *Bangka, Pulau*). FAS; B:SCS-18.

Mursala, Pulau, INDONESIA; 1°37′–1°42′N, 98°27′–98°36′E; collected 7–10 Mar. 1902 by W. L. Abbott (see Miller, 1903a, p. 438); USNM, 3 (including 1 skull only). FAS; B:IO-11.

Murung, Sungai, left bank, 1 km below mouth of Sungai Danau Tolong; *Borneo: Kalimantan,* INDONESIA; ca. 0°10′S, 114°13′E; observed 4–7 Sep. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Murung, Sungai, left bank, 2 km above mouth of Sungai Beriwit; *Borneo: Kalimantan,* INDONESIA; ca. 0°09′S, 114°17′E; observed 4–7 Sep. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Murung, Sungai, left bank, 2 km above mouth of Sungai Turusan; *Borneo: Kalimantan,* INDONESIA; ca. 0°11′S, 114°11′E; observed 4–8 Sep. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Murung, Sungai, left bank, 2 km below mouth of Sungai Turusan; *Borneo: Kalimantan,* INDONESIA; ca. 0°12′S, 114°08′E; observed 7–8 Sep. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Murung, Sungai, left bank, 8 km above Muarajuloi; *Borneo: Kalimantan,* INDONESIA; ca. 0°10′S, 114°08′E; observed 7–8 Sep. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Murung, Sungai, left bank, at mouth of Sungai Beriwit; *Borneo: Kalimantan,* INDONESIA; ca. 0°10′S, 114°15′E; observed 4–7 Sep. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Murung, Sungai, right bank, 1 km below mouth of Sungai Beriwit; *Borneo: Kalimantan,* INDONESIA; ca. 0°09′S, 114°15′E; observed 4–7 Sep. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Murung, Sungai, right bank, 1 km below mouth of Sungai Turusan; *Borneo: Kalimantan,* INDONESIA; ca. 0°11′S, 114°09′E; observed 7–8 Sep. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Murung, Sungai, right bank, 5 km above mouth of Sungai Turusan; *Borneo: Kalimantan,* INDONESIA; ca. 0°09′S, 114°12′E; observed 4–8 Sep. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Musi, Air, ca. 12 km below Palembang; *Sumatra,* INDONESIA; ca. 2°58′S, 104°51′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Musi, Air, ca. 15 km above mouth of Batang Harileko; *Sumatra,* INDONESIA; ca. 2°54′S, 103°58′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-62.

Musi, Air, ca. 15 km above Palembang; *Sumatra,* INDONESIA; ca. 3°02′S, 104°37′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Musi, Air, ca. 24 km below Palembang; *Sumatra,* INDONESIA; ca. 2°53′S, 104°54′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Musi, Air, ca. 30 km above mouth of Batang Harileko; *Sumatra,* INDONESIA; ca. 2°53′S, 103°51′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-62.

Musi, Air, ca. 30 km above Palembang; *Sumatra,* INDONESIA; ca. 3°04′S, 104°29′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Musi, Air, ca. 36 km below Palembang; *Sumatra,* INDONESIA; ca. 2°47′S, 104°56′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Musi, Air, ca. 45 km above mouth of Batang Harileko; *Sumatra,* INDONESIA; ca. 2°49′S, 103°44′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-62.

Musi, Air, ca. 48 km below Palembang; *Sumatra,* INDONESIA; ca. 2°41′S, 104°56′E; observed

Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Musi, Air, ca. 50 km above Palembang; *Sumatra,* INDONESIA; ca. 2°59′S, 104°19′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-62.

Musi, Air, ca. 60 km above mouth of Batang Harileko; *Sumatra,* INDONESIA; ca. 2°45′S, 103°39′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-62.

Musi, Air, ca. 60 km below Palembang; *Sumatra,* INDONESIA; ca. 2°35′S, 104°56′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Musi, Air, ca. 70 km above Palembang; *Sumatra,* INDONESIA; ca. 3°03′S, 104°10′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-62.

Musi, Air, ca. 72 km below Palembang; *Sumatra,* INDONESIA; ca. 2°28′S, 104°56′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Musi, Air, ca. 75 km above mouth of Batang Harileko; *Sumatra,* INDONESIA; ca. 2°44′S, 103°32′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-62.

Musi, Air, ca. 84 km below Palembang; *Sumatra,* INDONESIA; ca. 2°22′S, 104°54′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Musi, Air, ca. 85 km above Palembang; *Sumatra,* INDONESIA; ca. 2°57′S, 104°05′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-62.

Musi, Air, ca. 90 km above mouth of Batang Harileko; *Sumatra,* INDONESIA; ca. 2°43′S, 103°25′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-62.

Musi, Air, near Palembang; *Sumatra,* INDONESIA; ca. 2°59′S, 104°45′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Mutis, Gunung, 2100 m; *Pulau Timor,* Lesser Sunda Islands, INDONESIA; 9°34′S, 124°14′E; collected 28 Feb.–22 Mar. 1932 by G. Stein; MZB, 1; ZMB, 2. FAS; C:LS-28.

Myengun Kyun, BURMA; 19°50′–20°05′N, 92°55′–93°02′E; collected in 1847 by S. R. Tickell (1854–1875, p. [18]); museum unknown (not seen). AUR; A:Bu-2.

Naka Yai, Ko, THAILAND; 8°03′–8°04′N, 98°28′–98°29′E; collected 4 Feb. 1918 by local collectors employed by H. C. Robinson and C. B. Kloss (1919, p. 87); ZRC, 1. AUR/FAS/MUL; A:T-52.

Nakhon Si Thammarat; THAILAND; 8°26′N, 99°58′E; collected 27 Mar. 1924 and 19–29 Sep. 1926 by H. M. Smith (see Riley, 1938, p. 10); USNM, 2 (including 1 skull only); ZRC, 3. AUR/FAS/MUL; A:T-63.

Nakhorn Sawan. See Wat Khao Noh.

Nakon Sritammarat. See Nakhon Si Thammarat.

Nam Kam, Koh. See Nang Kham, Ko.

Nanas, Bukit, Kuala Lumpur; MALAYSIA: WEST MALAYSIA; 3°09′N, 101°42′E; collected 11 Nov. 1913, 6 Jun. 1938, and date unknown by museum collectors; BM(NH), 3. Observed Mar.–Jun. 1966 by I. S. Bernstein (1966, p. 1559; 1968a, p. 121). Observed Aug.–Dec. 1970 by C. H. Southwick and F. C. Cadigan, Jr. (1972, p. 11). FAS; B:WM-19.

Nancowry Island, Nicobar Islands, INDIA; 7°55′–8°02′N, 93°30′–93°34′E; primates reported absent before 1903 by G. S. Miller, Jr. (1902b, p. 792; cf. Kloss, 1903a, p. 114). A:l.

Nang Kham, Ko; THAILAND; ca. 7°20′N, 100°22′E; collected 12 Apr. 1899 by R. Evans and F. F. Laidlaw (see P. H. Napier, 1981, p. 17; Bonhote, [1901], p. 870); University Museum of Zoology, Cambridge, 1 (skull only, not seen). FAS; A:T-66.

Nanga Look, near Nggoer; *Pulau Flores,* Lesser Sunda Islands, INDONESIA; ca. 8°42′S, 119°48′E; observed 1969–1973 by W. Auffenberg (1981, p. 242). FAS; C:LS-13.

Nankauri Island. See *Nancowry Island.*

Natuna Besar, Pulau, INDONESIA; 3°37′–4°13′N, 107°59′–108°25′E; collected 17 Oct. 1893 by A. Everett (in Thomas & Hartert, 1894, p. 654; cf. W. Rothchild, 1894, p. 468); BM(NH), 1 (skin only, skull inside). Collected Aug. 1894 and Jan. 1896 by C. Hose and E. Hose; BM(NH), 1 (skin only, skull inside); MCZ, 2 (skins only, skulls inside). FAS; B:SCS-32, SCS-33.

Naunchik. See Nong Chik region.

Nawngchik, State. See Nong Chik region.

Negara, Taman; MALAYSIA: WEST MALAYSIA; ca. 4°42′N, 102°28′E; reported present ca. 1986 by M. K. B. M. Khan (1988, p. 267). FAS; B:WM-11.

Negris Island. See *Hainggyi Kyun.*

Ngarai Sianok, Bukit Tinggi; *Sumatra,* INDONESIA; not located; observed Feb. 1990 by M. Bismark (1992, p. 11). FAS: not mapped.

Ngawi; *Java,* INDONESIA; 7°24′S, 111°26′E; col-

lected 1887–1941 by E. Dubois; RMNH, 1 (skull only). FAS; C:J-30.

Nggoer. See Nanga Look, near Nggoer.

Nguwal, Pulau, Kepulauan Riau, INDONESIA; 0°38′–0°40′N, 104°13′–104°15′E; collected 3 Jan. 1925 by F. N. Chasen (1925, p. 93); ZRC, 6. FAS; B:SCS-11.

Niah Caves; *Borneo,* MALAYSIA: SARAWAK; 3°49′N, 113°47′E; reported present before 1959 by Lord Medway (1958, p. 634). FAS; C:Sar-16.

Niah National Park; *Borneo,* MALAYSIA: SARAWAK; ca. 4°00′N, 114°00′E; reported as probably present before 1983 by G. Davies ([1983], p. 148). FAS; C:Sar-17.

Nias, Pulau, INDONESIA; 0°33′–1°32′N, 97°03′–97°56′E; observed before 1864 by J. T. Nieuwenhuisen and H. C. B. von Rosenberg (1863, p. 19). Collected before 1890 by E. Modigliani (1889, p. 239); museum unknown, 18 specimens (not seen). Collected Nov. 1904 by W. L. Abbott (cf. Lyon, 1916, p. 458); ZRC, 1 (skull not examined). Reported present before 1906 by T. Willink (1905, p. 175). Collected date unknown by H. Raap and R. Knuth; ZMB, 2 (skulls only). Reported present Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). Blood samples taken from captives 1984–1989 by W. Scheffrahn, J. R. de Ruiter, and J. A. R. A. M. van Hooff (1994, p. 135). FAS; B:IO-6 through IO-10.

Nicobar Islands, INDIA; 6°45′–8°02′N, 93°20′–93°57′E; collected ca. 1846 by H. Lewis (see Blyth, 1846, p. 366; J. Anderson, 1881, p. 65; Khajuria, [1955], p. 109); formerly preserved in ZSI (not seen). Examined for malaria parasites in 1979 by L. Kalra (1980, p. 50). Examined for malaria parasites ca. 1984 by S. Sinha and A. Gajanana (1984, p. 567). UMB; A:N-1 through N-4.

Nikiniki, [720 m]; *Pulau Timor,* Lesser Sunda Islands, INDONESIA; 9°49′S, 124°28′E; collected 28 Mar. 1932 by G. Stein (see Hellmayr, 1914, p. 5); MZB, 1; ZMB, 1 (skin only). FAS; C:LS-27.

Nipah, Telok, vicinity; *Pulau Tioman,* MALAYSIA: WEST MALAYSIA; ca. 2°44′N, 104°08′E; observed Mar.–Apr. 1962 by Lord Medway (1966, p. 16). FAS; B:SCS-3.

Niur, Suaka Margasatwa Ujungkulon; *Java,* INDONESIA; 6°40′S, 105°21′E; observed 20 Aug. 1941 by A. Hoogerwerf (1970, p. 408). FAS; B:J-14.

Noesa Penida. See *Penida, Nusa.*

Nong Chik region; THAILAND; ca. 6°48′N, 101°12′E; collected 17 Sep. 1901 by N. Annandale and H. C. Robinson (1903, p. xxxiii; cf. Bonhote, 1903, p. 3); museum unknown, 1 (not seen). FAS; A:T-68.

Nongkok. See Ban Nong Kok.

North Andaman Island, INDIA; 12°53′–13°35′N, 92°48′–93°05′E; primates reported absent before 1928 by C. B. Kloss ([1928], p. 802; cf. Chaturvedi, 1980, p. 134). A:a.

North Borneo. See Sabah.

North Natuna Island. See *Laut, Pulau.*

North Pagi Island. See *Pagai Utara, Pulau.*

Ntori, Sape district, 420 m; *Pulau Sumbawa,* Lesser Sunda Islands, INDONESIA; 8°33′S, 118°52′E; collected 2 Jun. 1927 by Sunda-Expedition Rensch (see Mertens, 1930, p. 136); ZMB, 1. FAS; C:LS-12.

Nu Pau. See Nang Kham, Ko.

Nuri Valley; MALAYSIA: WEST MALAYSIA; ca. 2°34′N, 102°15′E; captive obtained ca. 1953 by J. F. B. Edeson and D. G. Davey (1953, p. 259). FAS; B:WM-25.

Nusa Mbarapu. See *Mbarapu, Nusa.*

Nusa Pinda. See *Pinda, Nusa.*

Nusa Rondong. See *Rondong, Nusa.*

Nusa Vadju. See *Vadju, Nusa.*

Nyalas; MALAYSIA: WEST MALAYSIA; 2°26′N, 102°28′E; collected 23 Oct. 1910 by museum collector; ZRC, 3 (including 2 skulls only; external measurements recorded on skull tag and in Weitzel et al., 1988, p. 107). FAS; B:WM-27.

Ober Langkat district; *Sumatra,* INDONESIA; ca. 3°45′N, 98°20′E; collected 1897–1899 by G. Schneider (1905, p. 72); museum and number of specimens unknown (not seen). FAS; B:S-20.

Ochodia, Naf River; BANGLADESH; ca. 21°05′N, 92°12′E; observed Sep. 1982–Feb. 1983 by M. A. R. Khan and M. A. Wahab (1983, p. 104; cf. M. A. R. Khan, 1981, p. 13; 1985, p. 30). AUR; A:Ba-1.

Oeassa (?= Oebuah) vicinity; *Pulau Semau,* Lesser Sunda Islands, INDONESIA; ca. 10°07′S, 123°27′E; observed ca. May 1859 by A. R. Wallace (1869, p. 294). FAS; C:LS-24.

Oebuah. See Oeassa.

Oewada Sami, Pulau. See *Kode, Nusa.*

Ok Yam. See Laem Ngop-Phumi Cham Yeam.

Ol-kolo-kwák vicinity; *Katchall Island,* Nicobar Islands, INDIA; 7°52′–8°02′N, 93°18′–93°27′E; collected 21 Feb. 1901 by W. L. Abbott (see Miller, 1902b, p. 751; Kloss, 1903a, p. 114); USNM, 2. UMB; A:N-1.

[Oo vicinity], *Pulau Sumbawa,* Lesser Sunda Islands, INDONESIA; ca. 8°25′S, 118°35′E; col-

lected 27 Nov. 1909 by J. Elbert (1912, p. 58); NMS, 1. FAS; C:LS-11.

Outer Bolongs. See *Myengun Kyun.*

Pacific Tin; MALAYSIA: WEST MALAYSIA; ca. 3°25′N, 101°25′E; examined for malaria ca. 1961–1962 by R. H. Wharton, D. E. Eyles, McW. Warren, and W. H. Cheong (1964, p. 58). FAS; B:WM-18.

Padang; *Sumatra,* INDONESIA; 0°57′S, 100°21′E; collected in 1836 by S. Müller; RMNH, 7 (skins only, skulls inside). Collected in 1890 by H. Meyer; ZMUZ, 2 (including 1 skin only). Collected date unknown by unknown collector; RMNH, 3; ZMUZ, 1 (skull only). Clinical examination Aug.–Nov. 1980 by K. Matsubayashi and D. Sajuthi (1981, p. 48). FAS; B:S-47.

Padang, Pulau, north coast, INDONESIA; ca. 1°22′N, 102°20′E; collected 27 Mar. 1906 by W. L. Abbott (field catalog; cf. Lyon, 1908, p. 624); USNM, 1 (skull only; external measurements recorded on skull tag). FAS; B:SM-6.

Padang/Bedagei district; *Sumatra,* INDONESIA; ca. 3°20′N, 99°10′E; collected 1897–1899 by G. Schneider (1905, p. 72); museum and number of specimens unknown (not seen). FAS; B:S-23.

Padang highlands; *Sumatra,* INDONESIA; ca. 0°57′S, 100°21′E; collected in 1878 by J. F. Snelleman (1887, p. 10); RMNH, 1. FAS; B:S-47.

Padangsidempuan, ca. 45 km NNW; *Sumatra,* INDONESIA; ca. 1°44′N, 99°07′E; reported present Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). FAS; B:S-34.

Padangsidempuan vicinity; *Sumatra,* INDONESIA; ca. 1°22′N, 99°16′E; reported present Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). FAS; B:S-33.

Padar, Pulau, Lesser Sunda Islands, INDONESIA; 8°38′–8°42′S, 119°32′–119°37′E; monkeys reported absent Jul. 1969–Jun. 1970 by W. Auffenberg (1981, p. 242). C:e.

Padar-kechil, Pulau. See *Padar-kecil, Pulau.*

Padar-kecil, Pulau, Lesser Sunda Islands, INDONESIA; 8°41′S, 119°32′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:e.

Padas Bay; *Borneo,* MALAYSIA: SABAH; ca. 5°13′N, 115°34′E; observed Jul.–Oct. 1968 by T. Mano (see Kawabe & Mano, 1972, p. 215). FAS; C:Sab-1.

Padeco, Hak Pengusahaan Hutan (HPH); *Sumatra,* INDONESIA; not located; observed Dec. 1988 by M. Bismark (1992, p. 11). FAS; not mapped.

Pagai Selatan, Pulau, INDONESIA; 2°47′–3°21′S, 100°10′–100°28′E; *M. fascicularis* reported absent before 1928 by C. B. Kloss ([1928], p. 802). B:i.

Pagai Utara, Pulau, INDONESIA; 2°30′–2°52′S, 99°58′–100°13′E; *M. fascicularis* reported absent before 1928 by C. B. Kloss ([1928], p. 802). B:h.

Pagansan; *Sumatra,* INDONESIA; ca. 1°00′N, 101°00′E; collected ca. 1907 by M. Moszkowski (1909, maps following pp. 192, 328); ZMB, 4 (skeletons only). FAS; B:S-40.

Pagat. See Hantakan, 3 km N of Pagat.

Pagurawan. See Paguruan, Sungai.

Paguruan, Sungai; *Sumatra,* INDONESIA; ca. 3°26′N, 99°20′E; collected 1897–1899 by G. Schneider (1905, p. 72); museum and number of specimens unknown (not seen). FAS; B:S-23.

Pai, Teluk; *Pulau Karimata,* INDONESIA; 1°32′–1°40′S, 108°48′–108°59′E; collected 24–27 Aug. 1904 by W. L. Abbott (see Miller, 1906b, p. 55); USNM, 2. FAS; B:SCS-22.

Paillin. See Pang Roloem-Sur Sdei area.

Pajakombo. See Payakumbuh.

Pajeti. See Payeti-Kambaniru.

Pajo, Danau Singkarak, Balipor district; *Sumatra,* INDONESIA; 0°37′S, 100°30′E; collected before 1880 by C. Bock (see P. H. Napier, 1981, p. 16); BM(NH), 1. FAS; B:S-46.

Pakan Selasa; *Sumatra,* INDONESIA; 1°34′S, 101°08′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-52.

Pakan Selasa, ca. 10 km SSE; *Sumatra,* INDONESIA; ca. 1°39′S, 101°10′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-52.

Pakchan River, near Bankachon; BURMA; ca. 10°09′N, 98°36′E; collected 29 Jan. 1914 and Dec. 1913–Apr. 1914 by G. C. Shortridge (in Wroughton, 1915, p. 696); BM(NH), 2. AUR/FAS/MUL; A:Bu-22.

Pakchan River, near Maliwun; BURMA; 10°14′N, 98°37′E; collected 28 Feb. 1928 by Faunthorpe-Vernay Expedition; AMNH, 1. AUR/FAS/MUL; A:Bu-22.

Pak Chong, Sathani; THAILAND; 14°42′N, 101°25′E; collected 29 Feb. 1924 by H. M. Smith (see Kloss, 1916a, p. 2; Riley, 1938, p. 1; Weitzel et al., 1988, p. 106); ZRC, 1. Collected 21 May 1931 by C. J. Aagaard; ZRC, 1. AUR/FAS/MUL; A:T-25.

Pak Jong. See Pak Chong, Sathani.

Pak Klong Pran. See Pran Buri, Mae Nam, mouth.

Pak Nam Chumphon. See Chumphon, Khlong, mouth.

Paknampoh. See Ban Pak Nam Pho.

Paku. See Pelandok, Sungai, Paku, Saribas.

Paku, Saribas; *Borneo,* MALAYSIA: SARAWAK; 1°27′N, 111°27′E; collected Mar. 1917 by C. Chunggat and H. C. Robinson (see P. H. Napier, 1981, p. 14); BM(NH), 2. FAS; C:Sar-9.

Paku Cave; *Borneo,* MALAYSIA: SARAWAK; 1°25′N, 110°11′E; collected 1870 and 1879, probably by A. H. Everett; BM(NH), Subdepartment of Anthropology, Department of Palaeontology, 2 (1 skeleton only, 1 skull only; not seen, data from P. H. Napier, 1981, p. 20). FAS; C:Sar-3.

Palembang, ca. 30 km N; *Sumatra,* INDONESIA; ca. 2°43′S, 104°46′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Palembang, ca. 30 km NNE; *Sumatra,* INDONESIA; ca. 2°44′S, 104°51′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Palembang, ca. 35 km SW; *Sumatra,* INDONESIA; ca. 3°13′S, 104°33′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Palembang, ca. 40 km N; *Sumatra,* INDONESIA; ca. 2°38′S, 104°48′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Palembang, ca. 40 km NNW; *Sumatra,* INDONESIA; ca. 2°39′S, 104°34′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Palembang, ca. 45 km N; *Sumatra,* INDONESIA; ca. 2°36′S, 104°43′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Palembang, ca. 45 km NW; *Sumatra,* INDONESIA; ca. 2°42′S, 104°28′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Palembang, ca. 50 km N; *Sumatra,* INDONESIA; ca. 2°32′S, 104°48′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Palembang, ca. 60 km NNE; *Sumatra,* INDONESIA; ca. 2°27′S, 104°51′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Palembang, ca. 60 km NNW; *Sumatra,* INDONESIA; ca. 2°32′S, 104°26′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Palembang, ca. 60 km NW; *Sumatra,* INDONESIA; ca. 2°37′S, 104°21′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Palembang, ca. 60 km SW; *Sumatra,* INDONESIA; ca. 3°20′S, 104°21′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-75.

Palembang, ca. 65 km N; *Sumatra,* INDONESIA; ca. 2°24′S, 104°41′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Palembang, ca. 65 km NNW; *Sumatra,* INDONESIA; ca. 2°27′S, 104°32′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Palembang, ca. 65 km SW; *Sumatra,* INDONESIA; ca. 3°20′S, 104°16′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-75.

Palembang, ca. 70 km N; *Sumatra,* INDONESIA; ca. 2°20′S, 104°42′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Palembang, ca. 70 km NNW; *Sumatra,* INDONESIA; ca. 2°29′S, 104°23′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Palembang, ca. 70 km SW; *Sumatra,* INDONESIA; ca. 3°23′S, 104°16′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-75.

Palembang, ca. 80 km N; *Sumatra,* INDONESIA; ca. 2°15′S, 104°48′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Palembang, ca. 90 km WSW; *Sumatra,* INDONESIA; ca. 3°19′S, 104°01′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-63.

Palembang, ca. 95 km SW; *Sumatra,* INDONESIA; ca. 3°28′S, 104°05′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-63.

Palembang, ca. 100 km N; *Sumatra,* INDONESIA; ca. 2°05′S, 104°47′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-61.

Palembang, ca. 100 km SW; *Sumatra,* INDONESIA; ca. 3°26′S, 103°58′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-63.

Palembang district; *Sumatra,* INDONESIA; ca.

2°55′S, 104°45′E; collected in 1905 by B. Hagen; ZSBS, 2 (skins only). FAS; B:S-61.

Palung, Gunung. See Gunung Palung Nature Reserve.

Pamuja, Tanjung; *Pulau Bangka,* INDONESIA; ca. 1°40′S, 105°20′E; collected 19 Jun. 1904 by W. L. Abbott (in Lyon, 1906, p. 607); USNM, 1. FAS; B:SCS-18.

Panaitan, Pulau, INDONESIA; 6°32′–6°46′S, 105°07′–105°16′E; observed 1932–1957 by A. Hoogerwerf (1970, p. 408). FAS; B:J-14.

Pandan, Sungai; *Singapore Island*; SINGAPORE; ca. 1°19′N, 103°45′E; observed before 1901 by S. S. Flower (1900, p. 316). FAS; B:SCS-7.

Pandang, Sungei. See Pandan, Sungai.

Panebangan, Pulau. See *Penebangan, Pulau.*

Pangadaran. See Pangandaran.

Pangandaran, Teluk Parigi; *Java,* INDONESIA; 7°41′S, 108°39′E; collected 4–11 Apr. 1908 by G. C. Shortridge (see Thomas & Wroughton, 1909a, p. 373); BM(NH), 3 (including 1 skin only, 1 skull only [with mounted skin, not examined]). Clinical examination in 1980 by K. Matsubayashi and D. Sajuthi (1981, p. 48). FAS; B:J-2.

Pangerango, Mt. See Pangrango, Gunung.

Pangkalan; Padang highlands; *Sumatra,* INDONESIA; ca. 0°57′S, 100°21′E; collected ca. 1889 by E. Dubois; RMNH, 3 (skulls only). FAS; B:S-47.

Pangkalansusu, *Sumatra,* INDONESIA; 4°07′N, 98°13′E; collected 15 Jun. 1972 by P. F. D. Van Peenen; USNM, 1 (infant in fluid). Collected before 1979 by NAMRU 2 Djakarta Detachment; USNM, 1 (skull only). FAS; B:S-19.

Pangkor, Pulau, MALAYSIA: WEST MALAYSIA; 4°12′–4°16′N, 100°32′–100°35′E; reported present ca. 1963 by J. L. Harrison and J. R. Hendrickson (1963, p. 548). FAS; B:SM-3.

Pangonan, Gunung Muria; *Java,* INDONESIA; ca. 6°36′S, 110°53′E; collected 19 Dec. 1928 by H. J. V. Sody; RMNH, 1. FAS; C:J-28.

Pangrango, Gunung; *Java,* INDONESIA; 6°46′S, 106°57′E; collected in 1899 by Bartels; NHRM, 27 (skulls only). Collected 4 Jul. 1902 and Feb. 1903 by unknown collectors; RMNH, 2 (skins only, skulls inside). FAS; B:J-18.

Pangrolim. See Pang Roloem–Sur Sdei area.

Pang Roloem–Sur Sdei area; CAMBODIA; ca. 12°50′N, 102°45′E; observed Oct. 1962 by D. E. Eyles, R. H. Wharton, W. H. Cheong, and McW. Warren (1964, p. 9). FAS; A:C-2.

Panjaer, Tanjong. See Tanjong Panjair, Sungai Rompin.

Panjang, Pulau. See Mentigi.

Pantai Krachut; *Pulau Pinang [1],* MALAYSIA: WEST MALAYSIA; 5°27′N, 100°11′E; collected 24 Mar. 1911 by E. Seimund (see Weitzel et al., 1988, p. 114); ZRC, 1. FAS; B:SM-2.

Pantar, Pulau, Lesser Sunda Islands, INDONESIA; 8°11′–8°33′S, 123°55′–124°19′E; *M. fascicularis* reported absent before 1937 by J. J. M. F. Symons (Mertens, 1936, p. 319). C:g.

Papagaran. See *Papagaran Besar, Pulau.*

Papagaran Besar, Pulau, Lesser Sunda Islands, INDONESIA; 8°34′–8°35′S, 119°43′–119°44′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:d.

Papar, 20 mi (= 32 km) SW of Kota Kinabalu; *Borneo,* MALAYSIA: SABAH; 5°44′N, 115°56′E; collected 12 Sep. 1960 by R. E. Kuntz (1969, p. 193); USNM, 1. FAS; C:Sab-3.

Pap-ka; *Sumatra,* INDONESIA; ca. 1°00′N, 101°00′E; collected Apr. 1908 by M. Moszkowski (1909, maps following pp. 192, 328); ZMB, 1 (skull only). FAS; B:S-40.

Parepare; *Pulau Sulawesi,* INDONESIA; 4°01′S, 119°38′E; captive (presumably introduced) observed 6–15 Oct. 1888 by M. Weber (1890a, p. v; 1890b, p. 102). Subspecies uncertain; not mapped.

Parit, primary swamp forest, sea level; *Borneo: Kalimantan,* INDONESIA; 2°10′S, 113°00′E; collected 15 Jun.–16 Jul. 1935 by J. J. Menden; AMNH, 20 (incuding 1 skull not examined, measurements from G. H. Albrecht, pers. comm., Oct. 1991); MZB, 3; ZMB, 4 (including 1 skin only). FAS; C:K-12.

Pasar Besar, Hak Pengusahaan Hutan (HPH); *Sumatra,* INDONESIA; not located; observed Jul. 1989 by M. Bismark (1992, p. 11). FAS; not mapped.

Pasar Usang area; *Sumatra,* INDONESIA; ca. 1°00′S, 100°25′E; blood samples taken Jan. 1979–Dec. 1981 by Y. Kawamoto (1982, p. 67). FAS; B:S-47.

Pasir Carolina, Purwakarta district; *Java,* INDONESIA; ca. 6°34′S, 107°26′E; collected 17 Aug. 1932 by Kloster; MZB, 1. FAS; B:J-20.

Pasir Panjang; *Pulau Bintan,* Kepulauan Riau, INDONESIA; ca. 1°10′N, 104°30′E; collected 7 Aug. 1902 by W. L. Abbott (field catalog; cf. Miller, 1906c, p. 282); USNM, 1. Collected 8 Jun. 1908 by H. C. Robinson (in Thomas & Wroughton, 1909b, p. 104); BM(NH), 1; ZRC, 1 (skull only). FAS; B:SCS-8.

Pasoh Forest Reserve, 50 m; MALAYSIA: WEST MALAYSIA; ca. 2°57′N, 102°22′E; observed Jul. 1978–Jun. 1981 by C. W. Marsh and W. L.

Wilson (1981, p. 232). Observed Jan. 1979–Jul. 1980 by J. O. Caldecott (1986b, p. 21). FAS; B:WM-20.

Patani. See Pattani.

Patani, Cape. See Pho, Laem.

Patong, Bukit, ca. 1 km west; MALAYSIA: WEST MALAYSIA; ca. 3°43′N, 102°02′E; observed Jul.–Dec. 1977 by D. Chivers and G. Davies (1979, p. 22). FAS; B:WM-15.

Pattani; THAILAND; 6°52′N, 101°16′E; collected 2 Jun. 1901 by H. C. Robinson (see Annandale & Robinson, 1903, p. xxi; Bonhote, 1903, p. 3); SMTD, 1 (skull only). FAS; A:T-68.

Payakumbuh, Padang highlands; *Sumatra,* INDONESIA; ca. 0°14′S, 100°38′E; collected ca. 1889 by E. Dubois; RMNH, 1 (skull only). FAS; B:S-45.

Payeti-Kambaniru; *Pulau Sumba,* Lesser Sunda Islands, INDONESIA; 9°39′S, 120°18′E; collected 26–27 Mar. 1925 by P. F. Franck (see Dammerman, 1926a, p. 38); MZB, 2. FAS; C:LS-22.

Pégou. See Pegu.

Pegu; BURMA; 17°20′N, 96°29′E; obtained in 1827–1828 by A. A. M. Reynaud (see de Rossel et al., 1829, p. 603; de Rossel, 1829, p. 609; I. Geoffroy, 1831, pp. 58, 77); museum unknown, 1 (not seen). Observed before 1889 by W. T. Blanford (1888b, p. 22). AUR; A:Bu-8.

Pejantan, Pulau, INDONESIA; 0°07′–0°09′N, 107°12′–107°15′E; observed 1–2 Aug. 1899 by W. L. Abbott (in Miller, 1900, p. 243; cf. Kloss, 1903b, p. 59). Collected 15 Mar. 1907 by C. Bruegel; ZSBS, 1 (skin only). FAS; B:SCS-25.

Pekan vicinity; MALAYSIA: WEST MALAYSIA; ca. 3°30′N, 103°25′E; observed 25–28 Jun. 1891 by H. N. Ridley, W. Davison, and H. J. Kelsall (see Kelsall, 1894a, p. 34). FAS; B:WM-13.

Pelabuhanratu, Teluk, 100 ft (= 30 m); *Java,* INDONESIA; 6°58′S, 106°32′E; collected 18 Mar. 1920 by C. B. Kloss (see Weitzel et al., 1988, p. 142); ZRC, 1. FAS; B:J-9.

Pelabuhanratu, Teluk, Bantam region; *Java,* INDONESIA; ca. 6°58′S, 106°32′E; collected 10 Nov. 1909 by O. Bryant (see field catalog of W. Palmer); USNM, 1. FAS; B:J-9.

Pelaihari; *Borneo: Kalimantan,* INDONESIA; 3°48′S, 114°45′E; collected 20 Aug. 1866 by J. Semmelink; RMNH, 1 (skin only, skull inside). Collected before 1897 by J. H. F. Kohlbrugge (1896a, p. 184); museum unknown, 1 (not examined). FAS; C:K-26.

Pelandok, Sungai, Paku, Saribas; *Borneo,* MALAYSIA: SARAWAK; 1°32′N, 110°44′E; collected 15 Aug. 1916 by H. C. Robinson (see Weitzel et al., 1988, p. 142); ZRC, 1. FAS; C:Sar-6.

Pelapis Tengah, Pulau, INDONESIA; 1°17′–1°20′S, 109°08′–109°10′E; reported present 29 May–1 June 1907 by W. L. Abbott (in Lyon, 1911, p. 60). Collected 21 Mar. 1931 by L. Coomans de Ruiter and Madzoed (see Chasen, 1935b, p. 2); MZB, 1. FAS; B:SCS-23.

Pelawan, Sungai; *Borneo: Kalimantan,* INDONESIA; 1°11′N, 117°55′E; collected 18 Dec. 1913 by H. C. Raven (field catalog; cf. Deignan, [1960], p. 269); USNM, 1. FAS; C:K-44.

Pelehari. See Pelaihari.

Peling, Pulo. See *Piling, Pulau.*

Pemanggil, Pulau, MALAYSIA: WEST MALAYSIA; 2°34′–2°36′N, 104°18′–104°21′E; collected 12 Jun. 1901 by W. L. Abbott (see Riley, 1938, p. 14); USNM, 1. Collected 12 Jul. 1915 by H. C. Robinson; BM(NH), 1. FAS; B:SCS-4.

Pemangil Island. See *Pemanggil, Pulau.*

Pematangsiantar; *Sumatra,* INDONESIA; 2°57′N, 99°03′E; collected Jul. 1937 by B. Lawrence; MCZ, 2. FAS; B:S-30.

Pemeral; *Pulau Karimun,* Kepulauan Riau, INDONESIA; 1°00′N, 103°25′E; collected 11 Aug. 1908 by H. C. Robinson (in Thomas & Wroughton, 1909b, pp. 105, 107) and E. Seimund; BM(NH), 4. FAS; B:SCS-17.

Penang Botanical Gardens; *Pulau Pinang [1],* MALAYSIA: WEST MALAYSIA; ca. 5°25′N, 100°20′E; observed 1940–1961 by K. C. Cheang (1962, p. 73). Observed Jul.–Sep. 1960 by Y. Furuya (1961–1962a, p. 76). Observed in 1974 by C. Spencer (1975, p. 83). FAS; B:SM-2.

Penang Hill; *Pulau Pinang [1],* MALAYSIA: WEST MALAYSIA; ca. 5°26′N, 100°16′E; reported present before 1976 by C. Spencer (1975, p. 85). FAS; B:SM-2.

Penang Island. See *Pinang, Pulau [1].*

Penang Waterfall Gardens. See Penang Botanical Gardens.

Penebangan, Pulau, INDONESIA; 1°10′–1°13′S, 109°13′–109°16′E; observed 16 May–21 Sep. 1907 by W. L. Abbott (in Lyon, 1911, p. 60). FAS; B:SCS-23.

Pengiki, Pulo. See *Pejantan, Pulau.*

Pengsong, Gunung; *Pulau Lombok,* Lesser Sunda Islands, INDONESIA; ca. 8°36′S, 116°06′E; blood samples taken Jan. 1979–Dec. 1981 by Y. Kawamoto (1982, p. 66). FAS; C:LS-5.

Penida, Nusa, 300 m, Lesser Sunda Islands, INDONESIA; 8°43′–8°48′S, 115°30′–115°36′E;

collected 26 Feb. 1938 by V. von Plessen; AMNH, 3. FAS; C:LS-4.

Penrissen, Gunung, 4000 ft (= 1200 m); *Borneo,* MALAYSIA: SARAWAK; 1°07′N, 110°13′E; collected May 1899 by E. A. W. Cox and R. W. L. Shelford (see Shelford, 1916, p. 217; cf. Medway, 1977, p. 71, who cited altitude as 4500 ft); SMK, 2 (skins only, skulls inside). FAS; C:Sar-2.

Penuba. See *Selayar, Pulau.*

Pepidon, Ko. See *Phi Phi Don, Ko.*

Perak, Sungai, upper. See Pong, upper Sungai Perak.

Perangin, Bukit, 75–360 m; MALAYSIA: WEST MALAYSIA; 6°22′N, 100°31′E; reported as probably present Jul. 1978–Jun. 1981 by C. W. Marsh and W. L. Wilson (1981, p. 232). FAS; B:WM-3.

Perawang, 4 km NW; *Sumatra,* INDONESIA; ca. 0°40′N, 101°35′E; observed Sep.–Nov. 1981 and Apr. 1983–Sep. 1984 by E. N. Megantara (1989, p. 183). FAS; B:S-42.

Perboewah, Kp. See Perbuah, Sungai Landak.

Perbuah, Sungai Landak, 900 m; *Borneo: Kalimantan,* INDONESIA; 0°53′N, 110°10′E; collected 27 Jul.–10 Aug. 1937 by J. J. Menden; AMNH, 9 (including 1 skin only); MZB, 2. FAS; C:K-4.

Perlis, Sungai, sea level; MALAYSIA: WEST MALAYSIA; 6°24′N, 100°10′E; observed Jul. 1978–Jun. 1981 by C. W. Marsh and W. L. Wilson (1981, p. 232). FAS; B:WM-2.

Petchaburi district. See "Siam."

Peucang, Pulau, INDONESIA; 6°43′–6°45′S, 105°14′–105°16′E; observed 1932–1957 by A. Hoogerwerf (1970, p. 408). Observed Sep. 1969–Jan. 1971 by W. Angst (1973, p. 626; 1975, p. 326). FAS; B:J-14.

Peutjang, Pulau. See *Peucang, Pulau.*

Pexabury. See Phet Buri.

Phai, Ko, THAILAND; 12°55′–12°57′N, 100°40′–100°41′E; primates reported as apparently absent Jan. 1915 by collectors employed by C. B. Kloss (1915a, p. 157; 1915b, p. 221). A:m.

Phangan, Ko, southwest, THAILAND; ca. 9°40′N, 100°00′E; collected 27 May 1913 by H. C. Robinson (1915, p. 129) and E. Seimund; ZRC, 2. FAS; A:T-50.

Phangnga Bay National Park; THAILAND; ca. 8°25′N, 98°37′E; observed 17–21 Nov. 1987 by R. Boonratana (1988, p. 76); also seen on unspecified adjacent islands. Subspecies uncertain; A:T-51.

Phattalung. See Wat Suwankuha.

Phayam, Ko, THAILAND; 9°42′–9°46′N, 98°23′–98°26′E; collected 20 Feb. 1919 by H. C. Robinson and C. B. Kloss; ZRC, 1. AUR/FAS/MUL; A:T-45.

Phet Buri; THAILAND; 13°06′N, 99°57′E; collected in 1862 by M. Boucourt; MNHN, 1 (skin only). Subspecies uncertain; A:T-37.

Phi Phi Don, Ko, THAILAND; 7°43′–7°47′N, 98°46′–98°48′E; collected 3–5 Feb. 1919 by H. C. Robinson (1921, p. 5) and C. B. Kloss; ZRC, 4. FAS; A:T-54.

Pho, Laem; THAILAND; ca. 6°57′N, 101°16′E; reported present Jun. 1901 by N. Annandale and H. C. Robinson (1903, p. xl). FAS; A:T-68.

Phu Phan, Maung district; THAILAND; 16°42′N, 104°25′E; collected date unknown by R. E. Elbel; USNM, 1 (skin No. 307714, skull No. 307732). AUR/FAS/MUL; A:T-15.

Phu-Qui. See *Phu Quoc, Dao.*

Phu Quoc, Dao, VIETNAM; 10°00′–10°27′N, 103°50′–104°05′E; observed 1873–1874 by A. Morice (1876, p. 31). Collected 30 Dec. 1927 by J. Delacour, W. P. Lowe, [and P. Jabouille] (in Delacour, 1928, p. 265); BM(NH), 1; MNHN, 1. FAS; A:V-6.

Phu-Quoi. See *Phu Quoc, Dao.*

Piling, Pulau, INDONESIA; 2°44′–2°46′N, 106°10′–106°12′E; observed 17 Aug. 1899 by W. L. Abbott and C. B. Kloss (in Miller, 1900, p. 244; cf. Kloss, 1903b, p. 68). FAS; B:SCS-27.

Pinagar; *Sumatra,* INDONESIA; 0°09′N, 99°55′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-43.

Pinagar, ca. 5 km SW; *Sumatra,* INDONESIA; ca. 0°07′N, 99°52′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-43.

Pinagar, ca. 20 km E; *Sumatra,* INDONESIA; ca. 0°09′N, 100°04′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-43.

Pinang, Pulau [1], up to 2000 ft (= 600 m) MALAYSIA: WEST MALAYSIA; 5°15′–5°29′N, 100°11′–100°20′E; reported present before 1847 by T. Cantor (1846, p. 176). Observed before 1901 by S. S. Flower (1900, p. 316). FAS; B:SM-2.

Pinang, Pulau [2], MALAYSIA: WEST MALAYSIA; 5°44′–5°45′N, 103°00′–103°01′E; collected 3 Sep. 1910 by C. B. Kloss (1911a, p. 177); BM(NH), 2. FAS; B:SCS-1.

Pinda, Nusa, Komodo area, Lesser Sunda Islands, INDONESIA; not located, ca. 8°30′S, 119°30′E;

monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). Not mapped.

Ping, Mae Nam; THAILAND; ca. 16°00′N, 99°50′E; collected 7 Mar. 1924 by A. S. Vernay (see Lowe, 1932, p. 202; 1933, p. 260); AMNH, 1 (skull only; external measurements recorded in AMNH catalog). Subspecies uncertain; A:T-4.

Pintu Gedong, Pulau, MALAYSIA: WEST MALAYSIA; 2°53′–2°56′N, 101°14′–101°16′E; collected 2–3 Nov. 1912 by museum collector; BM(NH), 1; ZRC, 2. FAS; B:SM-4.

P. Kemoedjan. See *Kemujan, Pulau.*

Plaine Sophie; *Mauritius Island,* MAURITIUS; 19°59′–20°31′S, 57°18′–57°48′E; introduced population, collected 25 Apr. 1949 by R. d'Unienville; BM(NH), 1. Subspecies uncertain; not mapped.

P. Lankawi. See *Langkawi, Pulau.*

Plateau des Bolovens. See Thateng, Muang, Plateau des Bolovens.

Pleihari Tanah Laut Game Sanctuary; *Borneo: Kalimantan,* INDONESIA; ca. 3°48′S, 114°45′E; reported present before 1983 by G. Davies ([1983], p. 148). FAS; C:K-26.

Pleyharie. See Pelaihari.

Podowk. See Ataran River.

Poelau (?= Kuda), Sungai Sibau; *Borneo: Kalimantan,* INDONESIA; ca. 1°02′N, 112°59′E; collected 19 Jun. 1894 by J. Büttikofer (1897, p. 20); RMNH, 1 (skin only). FAS; C:K-18.

Pong, upper Sungai Perak, 900 ft (= 275 m); MALAYSIA: WEST MALAYSIA; 5°36′N, 101°02′E; collected 16 Jan. 1932 by A. B. Holloway and A. S. Vernay (see P. H. Napier, 1981, p. 14); BM(NH), 1. FAS; B:WM-4.

Ponggol. See Punggol.

Pongka, Kampung; *Pulau Karimun,* Kepulauan Riau, INDONESIA; 1°06′N, 103°24′E; collected 25 May 1903 by W. L. Abbott (field catalog; cf. Miller, 1906c, p. 277); USNM, 1 (skull only). FAS; B:SCS-17.

Pontianak. See Ambawang, Sungai, near Pontianak.

Port Dickson; MALAYSIA: WEST MALAYSIA; 2°31′N, 101°48′E; collected 6 Jan.–2 May 1937 by E. Seimund; ZRC, 3. Collected before 1940 by F. Colyer; BM(NH) (skin)/RCS(OM) (skull), 1. FAS; B:WM-24.

Port Swettenham vicinity; MALAYSIA: WEST MALAYSIA; ca. 3°00′N, 101°24′E; reported present Aug.–Dec. 1970 by unspecified informants (Southwick & Cadigan, 1972, p. 10). FAS; B:WM-18.

Pota; *Pulau Flores,* Lesser Sunda Islands, INDONESIA; 8°20′S, 120°46′E; observed Apr.–May 1930 by Jhr. W. C. van Heurn (1932, p. 65). FAS; C:LS-18.

Poulo Condor. See *Con Son.*

Prachuap Khiri Khan, few miles north; THAILAND; ca. 11°50′N, 99°48′E; observed Nov. 1914–Feb. 1915 by N. Gyldenstolpe (1916, p. 10; 1917b, p. 6). AUR/FAS/MUL; A:T-41.

Prahmon. See Ban Phra Muang.

Pran Buri, Mae Nam, mouth; THAILAND; 12°24′N, 100°00′E; collected 28 Jun. 1917 by W. J. F. Williamson and M. A. Smith (see Kloss, 1917, p. 289); ZRC, 2. AUR/FAS/MUL; A:T-38.

Prang Koo; THAILAND; 15°40′N, 104°23′E; observed 17–18 Jul. 1989 by N. Aggimarangsee (1992, pp. 109, 120; pers. comm., Oct. 1993). Subspecies uncertain; A:T-16.

Preanger. See Ciwangi; Tasikmalaya, Preanger region; Tjeringin, near Banjar, Preanger region.

Preanger district; *Java,* INDONESIA; 6°36′–7°48′S, 106°22′–108°46′E; collected 12 Nov. 1890–8 Feb. 1891 by A. A. W. Hubrecht (see Zuckerman, [1933], p. 1062); museum unknown (not seen). FAS; B:J-6.

Preparis Island, BURMA; 14°51′–14°53′N, 93°40′–93°42′E; reported present before 1929 by C. B. Kloss ([1928], p. 806). AUR; A:Bu-5.

"P. Sember"; *Java,* INDONESIA; ca. 6°50′S, 108°15′E; clinical examination in 1980 by K. Matsubayashi and D. Sajuthi (1981, p. 48). FAS; B:J-22.

Pulaki, Tanjung; *Pulau Bali,* Lesser Sunda Islands, INDONESIA; 8°07′S, 114°35′E; observed Sep. 1969–Jan. 1971 by W. Angst (1975, p. 326). Blood samples taken in 1980 by Y. Kawamoto, K. Nozawa, and Tb. M. Ischak (1981, p. 16). FAS; C:LS-1.

Pulau Doem area; *Java,* INDONESIA; ca. 7°35′S, 112°30′E; blood samples taken 1979–1981 by Y. Kawamoto (1982, p. 67). FAS; C:J-37.

Pulau Kaban. See *Acheh, Pulau.*

Pulau Lontar. See *Lanta Yai, Ko.*

Pulau Misa. See *Misa, Pulau.*

Pulau Muntia. See *Muk, Ko.*

Pulau Panjang. See *Yao Noi, Ko.*

Pulau Panjang Anak. See *Yao Noi, Ko.*

Pulau Sulawesi, southern, INDONESIA; ca. 5°00′S, 120°00′E; introduced, reported present before 1883 by H. von Rosenberg (1882, p. 114). Reported present before 1930 by K. W. Dammer-

man (1929, p. 6). Subspecies uncertain; not mapped.

Pulau Telebong. See *Talibong, Ko.*

Pulau Telibun. See *Talibong, Ko.*

Pulo Beng Kalis. See Kapos Tinggi.

Pulo-Condore. See *Con Son.*

Pulo Gilla. See *Jela, Pulau.*

Pulo Mata. See *Matak, Pulau.*

Pulo Mobur. See *Mubur, Pulau.*

Pulo Nyur; *Great Nicobar Island,* west coast, INDIA; ca. 6°55′N, 93°40′E; observed 21 Mar. 1901 by C. B. Kloss (1903a, p. 150). UMB; A:N-3.

Pulo Peling. See *Piling, Pulau.*

Pulo Pengiki. See *Pejantan, Pulau.*

Pulo Piling. See *Piling, Pulau.*

Pulo Riabu. See *Airabu, Pulau.*

Pulo Selindang. See *Selintang, Pulau.*

Pulo Terutau. See *Tarutao, Ko.*

Pulo Tioman. See *Tioman, Pulau.*

Pulu Tikus. See *Tikus, Pulu.*

Punang, Sungai; *Borneo,* MALAYSIA: SARAWAK; 4°54′N, 115°21′E; collected 16 Apr. and 14–15 May 1939 by G. Nunong; SMK, 2 (skins only); ZRC, 2. FAS; C:Sar-22.

Punggol; *Singapore Island, SINGAPORE*; 1°25′N, 103°54′E; collected 8–11 Nov. 1910 by A. H. Wong; BM(NH), 1; ZRC, 4-086, 1. Collected 15–16 Dec. 1910 by unknown collector; ZRC, 2 (skins only). FAS; B:SCS-7.

Punoebo. See *Selayar, Pulau.*

Puram; *Borneo,* MALAYSIA: SARAWAK; not located, 0°43′–4°58′N, 109°34′–115°38′E; collected Jul. 1896 by W. H. Furness III (1896, p. 310) and H. M. Hiller (1896, p. 321); ANSP, 1 (skull only). FAS; not mapped.

Pura Uluwatu, Bukit Peninsula; *Pulau Bali,* southwestern tip, Lesser Sunda Islands, INDONESIA; not located, 8°04′–8°48′S, 114°26′–115°42′E; observed Jul.–Sep. 1993 by M. F. Small (1994, p. 8). FAS; not mapped.

Purukcahu, Sungai Barito; *Borneo: Kalimantan,* INDONESIA; 0°35′S, 114°35′E; collected before 1911 by G. C. Shortridge; BM(NH), 1 (skull only). Observed 1979–1986 by J. Marshall, D. J. Chivers, and K. M. Burton (see Chivers & Burton, [1991], p. 141). FAS; C:K-33.

Pussuk forest. See Pusuk forest.

Pusuk, Gunung; *Pulau Lombok,* Lesser Sunda Islands, INDONESIA; ca. 8°27′S, 116°07′E; blood samples taken Jan. 1979–Dec. 1981 by Y. Kawamoto (1982, p. 66). FAS; C:LS-5.

Pusuk forest; *Pulau Lombok,* Lesser Sunda Islands, INDONESIA; 8°25′S, 116°31′E; collected 11 Apr. 1927 by Sunda-Expedition Rensch (see B. Rensch, 1930, p. 46; Mertens, 1930, p. 129; I. Rensch, 1934, p. 227; Elbert, 1911, map 2); MZB, 1. FAS; C:LS-7.

Putussibau; *Borneo: Kalimantan,* INDONESIA; 0°50′N, 112°56′E; collected 19 Nov.–17 Dec. 1897 by A. Harrison, Jr., and H. M. Hiller; ANSP, 3. FAS; C:K-17.

Raba; *Pulau Sumbawa,* Lesser Sunda Islands, INDONESIA; 8°27′S, 118°46′E; blood samples taken Jul. 1981–Jan. 1982 by Y. Kawamoto, Tb. M. Ischak, and J. Supriatna (1982a, p. 58; cf. Kawamoto, 1982, p. 66; USBGN Gazetteer of Indonesia, 1982, p. 1036). FAS; C:LS-12.

Rachaburi. See Tham Chomphon, Wat Huai Takhaeng, and Wat Ratch Singkhorn.

Rakata, Pulau, INDONESIA; 6°08′–6°10′S, 105°25′–105°28′E; primates reported absent 1883–1934 by K. W. Dammerman (1948, p. 315); volcanic explosion in 1883. B:k.

Rakata-kecil, Pulau, INDONESIA; 6°05′–6°06′S, 105°26′–105°27′E; primates reported absent 1883–1934 by K. W. Dammerman (1948, p. 55); volcanic explosion in 1883. B:k.

Rana Mese, 1250–1400 m; *Pulau Flores,* Lesser Sunda Islands, INDONESIA; 8°38′S, 120°34′E; collected 19 Jun. 1927 by Sunda-Expedition Rensch (see B. Rensch, 1930, p. 148; Mertens, 1930, p. 139; I. Rensch, 1934, p. 227); NMS, 1. FAS; C:LS-15.

Ranau, ca. 1500 ft (= 450 m); *Borneo,* MALAYSIA: SABAH; 5°57′N, 116°41′E; collected 23 July 1937 by J. A. Griswold, Jr. (see Coolidge, 1940, p. 123); MCZ, 1. Collected 19–23 Sep. 1960 by R. E. Kuntz (1969, p. 193); USNM, 5. FAS; C:Sab-7.

"Rangoon"; BURMA; 16°47′N, 96°10′E; captive acquired 16 Dec. 1870 by unknown collector; RMNH, 1 (skin only). Captive acquired 8 May 1875 by unknown collector; RMNH, 1 (skin only). Subspecies uncertain; A:Bu-7.

Rangoon, near. See Desertion Creek, Elephant Point.

Rang Yai, Ko, THAILAND; 7°57′N, 98°26′E; collected 8 Feb. 1918 by local collectors employed by H. C. Robinson and C. B. Kloss (1919, p. 87); ZRC, 1. AUR/FAS/MUL; A:T-53.

Rantau; *Borneo: Kalimantan,* INDONESIA; 2°56′S, 115°09′E; collected 10 Mar. 1916 by F. C. E. van der Putten (see Hooijer, 1962b, p. 44); RMNH, 1 (skin only). FAS; C:K-28.

Rantau Panjang. See Kampong Rantau Panjang.

Rantauprapat vicinity; *Sumatra,* INDONESIA;

ca. 2°06′N, 99°50′E; reported present Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). FAS; B:S-35.

Ranun River. See Renun, Lae.

Ratburi district. See "Siam."

Rawa Danau. See Danau, Rawa.

Rawas; *Sumatra,* INDONESIA; not located, 5°38′–5°57′S, 95°12′–106°05′E; collected in 1906 by W. Volz; ZMB, 1 (skull only). FAS; not mapped.

Rayoh; *Borneo,* MALAYSIA: SABAH; 5°15′N, 115°50′E; collected 24 Jun. 1928 by G. Nunong (see Davis, 1962, pp. 10, 127; Weitzel et al., 1988, p. 143); ZRC, 1. FAS; C:Sab-2.

Rayong. See Wang Kaew.

Redang, Pulau, MALAYSIA: WEST MALAYSIA; 5°45′–5°49′N, 102°59′–103°03′E; collected 2–5 Sep. 1910 by C. B. Kloss (1911a, p. 177); ZRC, 2. FAS; B:SCS-1.

Renau. See Ranau.

Rengsam, Tanjung; *Pulau Bangka,* INDONESIA; 2°07′S, 105°35′E; collected 21 May 1904 by W. L. Abbott (in Lyon, 1907, p. 607); USNM, 1. FAS; B:SCS-18.

Renun, Lae; *Sumatra,* INDONESIA; ca. 3°05′N, 97°55′E; observed May–Dec. 1971 by J. R. MacKinnon (1973, p. 240). FAS; B:S-15.

Reo; *Pulau Flores,* Lesser Sunda Islands, INDONESIA; 8°19′S, 120°30′E; observed 21 Nov. 1888–9 Jan. 1889 by M. Weber (1890a, p. viii; 1890b, p. 102). Observed Apr.–May 1930 by Jhr. W. C. van Heurn (1932, p. 65). FAS; C:LS-17.

Riabu, Pulo. See *Airabu, Pulau.*

Riam, Kotawaringin district, 300 m; *Borneo: Kalimantan,* INDONESIA; 1°50′S, 111°54′E; collected 29 Oct.–3 Nov. 1935 by J. J. Menden; AMNH, 4 (including 1 skin only). Collected 31 [Oct.] 1935 by J. J. Menden; MZB, 1. FAS; C:K-8.

Rinca, Pulau, Lesser Sunda Islands, INDONESIA; 8°37′–8°48′S, 119°37′–119°47′E; observed 26 May—6 Jul. 1953 by A. Hoogerwerf (1954, p. 225; 1955, p. 26). Observed 18 Apr.–14 Jul. 1956 by P. Pfeffer (1959, p. 231). FAS; C:LS-13.

Rinjani, Gunung, 1700 m; *Pulau Lombok,* Lesser Sunda Islands; INDONESIA; ca. 8°24′S, 116°28′E; observed 23 Sep.–31 Oct. 1987 by D. Kitchener, Boeadi, L. Charlton, and Maharadatunkamsi (1990, p. 98). FAS; C:LS-7.

Rintja, Pulau. See *Rinca, Pulau.*

Rite; *Pulau Sumbawa,* Lesser Sunda Islands, INDONESIA; ca. 8°33′S, 118°53′E (cf. Raba); blood samples taken Jul. 1981–Jan. 1982 by Y. Kawamoto, Tb. M. Ischak, and J. Supriatna (1982a, p. 58). FAS; C:LS-12.

Roema Manoeal, south foot of Gunung Kenepai; *Borneo: Kalimantan,* INDONESIA; 0°40′N, 111°42′E; collected 27 Dec. 1893 by J. Büttikofer (1897, p. 12); RMNH, 2. FAS; C:K-5.

Roi-ed. See Wat Koo Pra Kona.

Roi-et. See Wat Koo Pra Kona.

Rokan-kanan, Sungai; *Sumatra,* INDONESIA; 1°23′N, 100°56′E; collected ca. 1907 by M. Moszkowski (1909, map following p. 328); ZMB, 3. FAS; B:S-38.

Rokankunan. See Rokan-kanan, Sungai.

Rompin, Sungai. See Tanjong Panjair, Sungai Rompin.

Rondong, Nusa, Komodo area, Lesser Sunda Islands, INDONESIA; not located, ca. 8°30′S, 119°30′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). Not mapped.

Ru, Pulo, BURMA; 9°56′–9°57′N, 98°32′–98° 34′E; collected 13 Nov. 1913 by G. C. Shortridge (in Wroughton, 1915, p. 696); BNHS, 1. AUR/FAS/MUL; A:Bu-23.

Rugading, near Bongkabong, near sea level; *Borneo,* MALAYSIA: SABAH; ca. 5°59′N, 116°04′E; collected 22 Aug. 1937 by J. A. Griswold, Jr. (see Coolidge, 1940, p. 123); MCZ, 1. FAS; C:Sab-4.

Rukumodia, Naf River; BANGLADESH; ca. 21°05′N, 92°12′E; observed Sep. 1982–Feb. 1983 by M. A. R. Khan and M. A. Wahab (1983, p. 104; cf. M. A. R. Khan, 1981, p. 13; 1985, p. 30). AUR; A:Ba-1.

Rungan, Sungai, right bank, 50 km above mouth; *Borneo: Kalimantan,* INDONESIA; ca. 1°47′S, 113°42′E; observed Jul. 1984–May 1986 by K. M. Burton (see Chivers & Burton, [1991], p. 140). FAS; C:K-22.

Rungan, Sungai, right bank, above mouth; *Borneo: Kalimantan,* INDONESIA; ca. 2°09′S, 113°53′E; 2 troops observed Jul. 1984–May 1986 by K. M. Burton (see Chivers & Burton, [1991], p. 140). FAS; C:K-23.

Rupat, Pulau, INDONESIA; 1°41′–2°08′N, 101°23′–101°47′E; reported present 24 Feb.–3 Apr. 1906 by W. L. Abbott (in Lyon, 1908, p. 624). FAS; B:SM-5.

Rupat Tinggi. See Kapos Tinggi.

Rutland Island, Andaman Islands, INDIA; 11°21′–11°31′N, 92°35′–92°42′E; primates reported absent before 1903 by G. S. Miller, Jr. (1902b, p. 792; cf. Kloss, [1928], p. 802; Chaturvedi, 1980, p. 134). A:g.

Sababi, Pulau, Lesser Sunda Islands, INDONESIA; 8°21′–8°22′S, 120°01′–120°02′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:d.

Sabah; *Borneo,* MALAYSIA: SABAH; 4°06′–7°02′N, 115°26′–119°17′E; collected 24 Aug.–4 Oct. 1960 by R. E. Kuntz (1969, p. 193); USNM, 4. FAS; not mapped.

Sabajor. See *Sabajor Besar, Pulau.*

Sabajor Besar, Pulau, Lesser Sunda Islands, INDONESIA; 8°29′–8°31′S, 119°43′–119°44′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:d.

Sabalan. See *Sebolon Besar, Pulau.*

Sabor; *Pulau Banggi,* MALAYSIA: SABAH; 7°14′N, 117°14′E; collected 19 Jun. 1991 by Shukor Md. Nor (pers. comm., 17 Jul. 1991); FMNH, 1. FAS; C:Sab-10.

Saigon. See Ho Chi Minh City.

Saint Matthew's Island. See *Zadetkyi Kyun.*

Sakerat. See Ban Sakaerat.

Salak, Gunung, 2000 m; *Java,* INDONESIA; 6°42′S, 106°44′E; collected Nov. 1931 and date unknown by H. J. V. Sody; RMNH, 3 (including 2 skulls only). FAS; B:J-17.

Salikan, Mt. See Selikan, Bukit.

Sama, Sungei. See Ambawang, Sungai, near Pontianak.

Samarinda. See Karangmumus, Sungai, near Samarinda, and Mahakam, Sungai, north bank, above Samarinda.

Samasama; *Pulau Nias,* INDONESIA; 0°58′N, 97°54′E; collected 21 Feb. 1905 by W. L. Abbott (field catalog; cf. Lyon, 1916, p. 458); USNM, 1. FAS; B:IO-9.

Samui, Ko, center of island, 300 ft (= 90 m), THAILAND; ca. 9°30′N, 100°00′E; collected 15 May 1913 by H. C. Robinson (1915, p. 129; cf. P. H. Napier, 1981, p. 17) and E. Seimund; BM(NH), 1. FAS; A:T-49.

Samuk, Khao; THAILAND; 13°19′N, 100°54′E; reported present in 1981 by W. Y. Brockelman (1981, p. 13). Observed 10–16 Nov. 1990 by N. Aggimarangsee (1992, pp. 110, 129; pers. comm., Oct. 1993). FAS; A:T-31.

Samunsam Wildlife Sanctuary; *Borneo,* MALAYSIA: SARAWAK; ca. 2°00′N, 109°38′E; reported present in 1980 by S. Joines (1981, p. 9). Observed before 1987 by G. Hohmann and W. P. Peter (1986, pp. 89, 92). FAS; C:Sar-1.

Samut Songkhram vicinity; THAILAND; ca. 13°24′N, 100°00′E; observed Mar. 1909 by K. G. Gairdner (1914, p. 28). Subspecies uncertain; A:T-37.

Samut Song Kram. See Samut Songkhram.

Sandakan, 8 mi (= 13 km) W; *Borneo,* MALAYSIA: SABAH; ca. 5°50′N, 118°00′E; collected 29 Aug. 1929 by F. C. Wonder (see Davis, 1962, p. 10); FMNH, 1 (skull only). FAS; C:Sab-17.

Sandaran Agong, Kerinci region, 2450 ft (= 750 m); *Sumatra,* INDONESIA; 2°07′S, 101°32′E; collected 6 Jun. 1914 by H. C. Robinson and C. B. Kloss (1918, p. 6; in Pendlebury, 1936, p. 27); ZRC, 1. FAS; B:S-50.

Sangeang, Pulau, Lesser Sunda Islands, INDONESfIA; 8°08′–8°16′S, 119°00′–119°07′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:c.

Sangeh; *Pulau Bali,* Lesser Sunda Islands, INDONESIA; 8°28′S, 115°14′E; observed Sep. 1969–Jan. 1971 by W. Angst (1975, p. 326). Observed 21 Aug. 1973 by J. Fooden. Observed in 1980 by A. Bakar, M. Amir, and Marshal (1981, p. 11). Observed Jul.–Sep. 1993 by M. F. Small (1994, p. 8). FAS; C:LS-3.

Sanggul, Bukit, Propinsi Bengkulu, 500 m; *Sumatra,* INDONESIA; 3°50′S, 102°37′N; collected 15–19 Aug. 1936 by J. J. Menden; AMNH, 5; MZB, 3. FAS; B:S-71.

Sanglang-besar, Pulau, Kepulauan Riau, INDONESIA; 0°36′–0°38′N, 103°41′–103°42′E; monkeys reported absent 10–11 Jul. 1903 by W. L. Abbott (see Miller, 1906c, p. 280). Not mapped.

Sanglar. See *Sanglang-besar, Pulau.*

Sano, Wai, 650 m; *Pulau Flores,* Lesser Sunda Islands, INDONESIA; 8°42′S, 120°00′E; collected 18 Nov. 1929 by Denin; MZB, 1. FAS; C:LS-14.

Sapagaya Forest Reserve, near sea level; *Borneo,* MALAYSIA: SABAH; 5°37′N, 118°04′E; collected 9 Aug. 1950 by D. D. Davis (1962, p. 11); FMNH, 2. FAS; C:Sab-18.

Sapeh. See Ntori, Sape district.

Sap Khao, 280 m; THAILAND; 15°35′N, 99°18′E; observed 29 Nov. 1973 and 25 Jan. 1975 by A. A. Eudey (1979, pp. 90, 198). Subspecies uncertain; A:T-19.

Sarawak; *Borneo,* MALAYSIA: SARAWAK; 0°52′–4°58′N, 109°33′–115°38′E; collected in 1879, probably by A. H. Everett; BM(NH), Subdepartment of Anthropology, Department of Palaeontology, 3 (1 maxillary fragment, 2 isolated molars; not seen, data from P. H. Napier, 1981, p. 20). FAS; not mapped.

Sarawak, Sungai, mouth; *Borneo,* MALAYSIA: SARAWAK; ca. 1°38′N, 110°27′E; observed 1897–1912 by R. W. C. Shelford (1916, p. 10). FAS; C:Sar-4.

Saribas. See Pelandok, Sungai, Paku, Saribas.

Sarn Pra Karn, Lopburi; THAILAND; 14°48′N, 100°37′E; observed 24 Feb. and 18 Apr. 1967 by J. Fooden (1971, p. 16). Observed before 1976 by F. C. Cadigan and Lim Boo Liat (1975, p. 86). Observed 22 Jun.–9 Jul. 1989 by N. Aggimarangsee (1992, pp. 109, 124; pers. comm., Oct. 1993). Subspecies uncertain; A:T-7.

Sarongen; *Java,* INDONESIA; ca. 6°27′S, 106°00′E; collected 13 Nov. 1909 by O. Bryant (see field catalog in USNM); MCZ, 1. FAS; B:J-12.

Sarongge. See Sarongen.

Sebang. See *Sebangka, Pulau.*

Sebangka, Pulau, INDONESIA; 0°01′–0°15′N, 104°29′–104°43′E; reported present 26–31 Jul. 1903 by W. L. Abbott (see Miller, 1906c, p. 284). FAS; B:SCS-12.

Sebatik, Pulau; MALAYSIA: SABAH; 4°10′–4°17′N, 117°38′–117°53′E; collected 4 Jan. 1910 by R. C. Andrews (1911, p. 22; 1943, p. 69); AMNH, 1 (skin only); USNM, 2. FAS; C:Sab-12.

Sebattick Island. See *Sebatik, Pulau.*

Sebattik Island. See *Sebatik, Pulau.*

Sebesi, Pulau, INDONESIA; 5°55′–5°58′S, 105°28′–105°32′E; primates reported absent Sep. 1920–Jan. 1922) by K. W. Dammerman (1948, p. 68). B:1.

Sebesy Island. See *Sebesi, Pulau.*

Sebolon Besar, Pulau, Lesser Sunda Isllands, INDONESIA; 8°24′S, 119°49′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:d.

Sebuku, Pulau, INDONESIA; 3°22′–3°38′S, 116°19′–116°27′E; reported present 31 Dec. 1907–5 Jan. 1908 by W. L. Abbott (in Lyon, 1911, p. 62). FAS; C:K-52.

Sechawa. See *Bakung, Pulau.*

Sedagong, 900 m; *Pulau Tioman,* MALAYSIA: WEST MALAYSIA; ca. 2°48′N, 104°11′E; collected 14–20 May 1927 by N. Smedley: ZRC, 2. FAS; B:SCS-3.

Segaliud River. See Lungmanis Station, Sungai Segaliud.

Segama, Sungai; *Borneo,* MALAYSIA: SABAH; 4°43′–5°25′N, 117°38′–118°47′E; collected 22 Aug. 1907 by Dr. Pagel; ZMB, 1 (skull only); FAS; C:Sab-21.

Segobang, Sungai; *Borneo,* MALAYSIA: SARAWAK; 2 rivers by this name in Sarawak (mouth of one at 1°23′N, 110°E; mouth of other at 4°47′N, 114°58′E); collected 18 Sep. 1892 by E. Bartlett; SMK, 1 (skin only, skull inside). FAS; not mapped.

Sekol, Sungai, 100 m; MALAYSIA: WEST MALAYSIA; 1°54′N, 103°39′E; observed Jul. 1978–Jun. 1981 by C. W. Marsh and W. L. Wilson (1981, p. 232). FAS; B:WM-29.

Sekonyer Kanan River (?= Sikunir, Sungai), Tanjung Puting National Park; *Borneo: Kalimantan,* INDONESIA; ca. 2°50′S, 111°47′E; observed 1977–1983 by B. M. F. Galdikas and C. P. Yeager (1984, p. 50). FAS; C:K-9.

Selai, Sungai; MALAYSIA: WEST MALAYSIA; 2°16′N, 103°25′E; observed Jul. 1978–Jun. 1981 by C. W. Marsh and W. L. Wilson (1981, p. 232). FAS; B:WM-28.

Selama. See Ulu Ijok.

Selatbliat; *Pulau Kundur,* Kepulauan Riau, INDONESIA; ca. 0°53′N, 103°22′E; collected 18–20 Aug. 1908 by H. C. Robinson (in Thomas & Wroughton, 1909b, pp. 105, 107) and E. Seimund; BM(NH), 2. FAS; B:SCS-17.

Selayar, Pulau, INDONESIA; 0°17′–0°20′S, 104°23′–104°29′E; reported present 2–6 Aug. 1903 by W. L. Abbott (see Miller, 1906c, p. 280). FAS; B:SCS-14.

Selikan, Bukit; *Borneo,* MALAYSIA: SARAWAK; 3°31′N, 114°04′E; collected July 1895 by E. Hose and C. Hose; USNM, 1. FAS; C:Sar-14.

Selindang, Pulo. See *Selintang, Pulau.*

Selintang, Pulau, INDONESIA; 0°57′–0°58′N, 107°28′–107°29′E; observed 3–7 Aug. 1899 by W. L. Abbott (in Miller, 1900, p. 243; cf. Kloss, 1903b, p. 60). FAS; B:SCS-26.

Semao Island. See Oeassa.

Semarang; *Java,* INDONESIA; 6°58′S, 110°25′E; collected 1907–1908 by C. Bruegel and/or U. Schaule; ZSBS, 1 (skin only). FAS; C:J-26.

Sembakung, Sungai; *Borneo: Kalimantan,* INDONESIA; ca. 3°50′N, 117°00′E; collected Jul. 1912 by Mohari (see Sody, 1949, p. 180); MZB, 2. FAS; C:K-37.

Sembaloen. See Pusuk forest.

Sembawang, Sungai; *Singapore Island,* SINGAPORE; 1°27′N, 103°50′E; collected 21 May 1922 by F. N. Chasen; ZRC, 1 (skin only). FAS; B:SCS-7.

Sember, P. See "P. Sember."

Sembilan Kepulauan, MALAYSIA: WEST MALAYSIA; ca. 4°02′N, 100°33′E; primates reported absent in 1953 by J. L. Harrison and J. R. Hendrickson (1963, p. 548). B:c.

Sembrong River. See Endau, Sungai, vicinity.

Semitau, Sungai Kapuas; *Borneo: Kalimantan,* INDONESIA; 0°33′N, 111°58′E; collected 15 Dec. 1893 by J. Büttikofer (1897, p. 11); RMNH, 1. FAS; C:K-6.

Semongkat; *Pulau Sumbawa,* Lesser Sunda Is-

lands, INDONESIA; 8°35′S, 117°20′E; collected 31 Oct. 1981 by M. Aimi (pers. comm., 3 Aug. 1990; cf. Kawamoto et al., 1984, p. 132); PRI, 1 (skeleton only). Blood samples taken Jul. 1981–Jan. 1982 by Y. Kawamoto, Tb. M. Ischak, and J. Supriatna (1982, p. 58). FAS; C:LS-8.

Sendang; *Pulau Bali,* Lesser Sunda Islands, INDONESIA; 8°08′S, 114°38′E; collected ca. 1930 by H. J. V. Sody (1933, p. 93); RMNH, 3. FAS; C:LS-1.

Sendung; *Borneo,* country unknown; not located, 7°02′N–4°11′S, 108°51′–119°17′E; collected 24 Apr. 1902 by Dr. Pagel; ZMB, 1 (skin only). FAS; not mapped.

Sengata; *Borneo: Kalimantan,* INDONESIA; 0°28′N, 117°33′E; observed summer 1971 by J. A. Kurland (1973, p. 250). FAS; C:K-46.

Sengata, Sungai, 1 km below Mentoko camp; *Borneo: Kalimantan,* INDONESIA; ca. 0°31′N, 117°22′E; observed 1983–1989 by A. Suzuki (1989, p. 32). FAS; C:K-46.

Sengata, Sungai, 2 km below Mentoko camp; *Borneo: Kalimantan,* INDONESIA; ca. 0°31′N, 117°23′E; observed 1983–1989 by A. Suzuki (1989, p. 32). FAS; C:K-46.

Sengata, Sungai, 3 km below Mentoko camp; *Borneo: Kalimantan,* INDONESIA; ca. 0°32′N, 117°24′E; observed 1983–1989 by A. Suzuki (1989, p. 32). FAS; C:K-46.

Sengata, Sungai, 5 km below Mentoko camp; *Borneo: Kalimantan,* INDONESIA; ca. 0°32′N, 117°25′E; 2 troops observed 1983–1989 by A. Suzuki (1989, p. 32). FAS; C:K-46.

Sengata, Sungai, 7 km below Mentoko camp; *Borneo: Kalimantan,* INDONESIA; ca. 0°33′N, 117°26′E; observed 1983–1989 by A. Suzuki (1989, p. 32). FAS; C:K-46.

Sengata, Sungai, 9 km below Mentoko camp; *Borneo: Kalimantan,* INDONESIA; ca. 0°33′N, 117°27′E; 2 troops observed 1983–1989 by A. Suzuki (1989, p. 32). FAS; C:K-46.

Sengata, Sungai, 11 km below Mentoko camp; *Borneo: Kalimantan,* INDONESIA; ca. 0°30′N, 117°28′E; observed 1983–1989 by A. Suzuki (1989, p. 32). FAS; C:K-46.

Sengata, Sungai, 13 km below Mentoko camp; *Borneo: Kalimantan,* INDONESIA; ca. 0°30′N, 117°29′E; observed 1983–1989 by A. Suzuki (1989, p. 32). FAS; C:K-46.

Sengata, Sungai, at Mentoko camp; *Borneo: Kalimantan,* INDONESIA; ca. 0°30′N, 117°22′E; observed 1983–1989 by A. Suzuki (1989, p. 32). FAS; C:K-46.

Sengata, Sungai, below Sengata village; *Borneo: Kalimantan,* INDONESIA; ca. 0°27′N, 117°35′E; 12 troops observed 14 Apr. 1973 by C. C. Wilson and W. L. Wilson (1975, p. 257). FAS; C:K-46.

Sengata, Sungai, Kutai Reserve; *Borneo: Kalimantan,* INDONESIA; 0°32′N, 117°28′E; observed 2–6 Apr. 1973 by C. C. Wilson and W. L. Wilson (1975, p. 257). Observed 26 Jan. 1973–31 Jan. 1974 by N. A. Fittinghoff, Jr., and D. G. Lindburg (1980, p. 185). FAS; C:K-46.

Sengata, Sungai, right bank, 1 km below mouth of Sungai Nubung, Kutai Reserve; *Borneo: Kalimantan,* INDONESIA; ca. 0°32′N, 117°07′E; observed 13 Oct. 1985 by A. Suzuki (1986, p. 16). FAS; C:K-47.

Sengatta River. See Sengata, Sungai.

Senimba Bay; *Pulau Batam,* Kepulauan Riau, INDONESIA; 1°05′N, 103°56′E; observed 22 Mar. 1906 by C. B. Kloss (1908, p. 65). FAS; B:SCS-10.

Senoeang, 500 m; *Borneo: Kalimantan,* northeast, INDONESIA; ca. 1°00′N, 110°00′E; collected 29 Aug. 1937 by J. J. Menden; AMNH, 1 (skin only; male skin mismatched with female skull); FAS, C:K-3.

Sentosa Island, SINGAPORE; 1°14′–1°16′N, 103°48′–103°51′E; observed before 1901 by S. S. Flower (1900, p. 316). FAS; B:SCS-7.

Sepaku, Sungai, ca. 350 m NE of camp, 15–50 m; *Borneo: Kalimantan,* INDONESIA; ca. 0°53′S, 116°43′E; observed 11–13 Mar. 1973 by C. C. Wilson and W. L. Wilson (1975, pp. 248, 254). FAS; C:K-50.

Sepilok Forest Reserve. See Labuk Road, Sepilok Forest Reserve.

Seraja, Pulau. See *Seraya Besar, Pulau.*

Serang Daja. See Serangjaya-hilir.

Serang Djaja. See Serangjaya-hilir.

Serangjaya-hilir; *Sumatra,* east coast, INDONESIA; 4°15′N, 98°12′E; collected Oct.–Nov. 1931 by H. J. V. Sody; RMNH, 2 (skulls only). FAS; B:S-19.

Serapit Tandjung; *Sumatra,* INDONESIA; ca. 3°33′N, 98°20′E; collected 1897–1899 by G. Schneider (1905, p. 72); museum and number of specimens unknown (not seen). FAS; B:S-20.

Serasan, Pulau, INDONESIA; 2°28′–2°33′N, 108°58′–109°07′E; observed Sep. 1893 by A. Everett (in Thomas & Hartert, 1894, p. 654). Collected 8 Jun. 1900 by W. L. Abbott (see Miller, 1901, p. 111); USNM, 1. Collected 27 Aug. 1931 by P. M. de Fontaine (see Chasen, 1935a, p. 5); ZRC, 1. FAS; B:SCS-36.

Seraya Besar, Pulau, Lesser Sunda Islands, IN-

DONESIA; 8°22′–8°24′S, 119°50′–119°52′E; reported present 1969–1973 by W. Auffenberg (1981, p. 40). FAS; C:LS-13.

Serdang district; *Sumatra,* INDONESIA; ca. 3°30′N, 99°00′E; collected 2 Feb. 1905 by H. Dürk (see Schneider, 1905, map 1); ZSBS, 1. FAS; B:S-22.

Sertung, Pulau, INDONESIA; 6°03′–6°07′S, 105°22′–105°24′E; primates reported absent 1883–1934 by K. W. Dammerman (1948, p. 50); volcanic explosion in 1883. B:k.

Serutu, Pulau, INDONESIA; 1°42′–1°44′S, 108°41′–108°48′E; collected 25 Mar. 1931 by L. Coomans de Ruiter and Madzoed (see Chasen, 1935b, p. 2); MZB, 1. FAS; B:SCS-21.

Sewela; *Pulau Lombok,* Lesser Sunda Islands, INDONESIA; 8°32′S, 116°35′E; collected 22–26 Mar. 1927 by Sunda-Expedition Rensch (see B. Rensch, 1930, p. 12; Mertens, 1930, p. 127; I. Rensch, 1934, p. 228); NMS, 2. FAS; C:LS-7.

S'gobang. See Segobang, Sungai.

Shanghai; CHINA; 31°14′N, 121°28′E; captive (introduced) obtained Jul. 1858 by J. Zelebor or von Frauenfeld (Zelebor, [1869], p. 8; cf. Fitzinger, 1861, p. 389). Subspecies uncertain; not mapped.

Siaba. See *Siaba Besar, Pulau.*

Siaba, Teluk; *Pulau Nias,* INDONESIA; 1°31′N, 97°24′E; collected 16–20 Mar. 1903 by W. L. Abbott (see Lyon, 1916, p. 458); USNM, 7 (including 3 skulls only, 2 with external measurements recorded on skull tags); FAS; B:IO-10.

Siaba Besar, Pulau, Lesser Sunda Islands, INDONESIA; 8°32′–8°33′S, 119°41′–119°42′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:d.

Siaboh. See Sibaboh, Lugu.

Siak, Sungai, ca. 12 km above mouth; *Sumatra,* INDONESIA; ca. 1°14′N, 102°10′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-42.

Siak, Sungai, ca. 15 km below Pekanbaru; *Sumatra,* INDONESIA; ca. 0°35′N, 101°34′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-42.

Siak, Sungai, ca. 24 km above mouth; *Sumatra,* INDONESIA; ca. 1°07′N, 102°10′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-42.

Siak, Sungai, ca. 30 km below Pekanbaru; *Sumatra,* INDONESIA; ca. 0°42′N, 101°39′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-42.

Siak, Sungai, ca. 36 km above mouth; *Sumatra,* INDONESIA; ca. 1°01′N, 102°07′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-42.

Siak, Sungai, ca. 45 km below Pekanbaru; *Sumatra,* INDONESIA; ca 0°47′N, 101°44′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-42.

Siak, Sungai, ca. 48 km above mouth; *Sumatra,* INDONESIA; ca. 0°55′N, 102°05′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-42.

Siak, Sungai, ca. 60 km above mouth; *Sumatra,* INDONESIA; ca. 0°48′N, 102°05′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-42.

Siak, Sungai, ca. 60 km below Pekanbaru; *Sumatra,* INDONESIA; ca 0°45′N, 101°51′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-42.

Siak, Sungai, ca. 75 km below Pekanbaru; *Sumatra,* INDONESIA; ca. 0°48′N, 101°58′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-42.

Siak, Sungai, near mouth; *Sumatra,* INDONESIA; ca. 1°20′N, 102°10′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-42.

Siak, Sungai, near Pekanbaru; *Sumatra,* INDONESIA; ca. 0°32′N, 101°27′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-42.

Siak Copatta; *Sumatra,* INDONESIA; ca. 1°00′N, 101°00′E; collected ca. 1907 by M. Moszkowski (1909, map following p. 192); ZMB, 1 (skull only). FAS; B:S-40.

Siam. See THAILAND.

"Siam"; THAILAND; "13°45′N, 99°25′E"; collected 18 Jun. 1913 and date unknown by K. G. Gairdner (1914, pp. 34–36; cf. P. H. Napier, 1981, p. 20, who cited this locality as "E. Siam"); BM(NH), 2 (skulls only). Subspecies uncertain; A:T-27.

Siantan, Pulau, INDONESIA; 3°04′–3°13′N, 106°12′–106°17′E; collected 8 Sep. 1899 by W. L. Abbott (in Miller, 1900, p. 244; cf. Kloss, 1903b, p. 69; Oberholser, 1917, p. 2); USNM, 1. Collected 14 Sep. and 3 Oct. 1925 by F. N. Chasen (see Chasen & Kloss, 1928a, p. 43); ZRC, 2. FAS; B:SCS-30.

Sibabo. See Sibaboh, Lugu.

Sibaboh, Lugu; *Pulau Simeulue,* INDONESIA; 2°43′N, 96°06′E; collected 17 Dec. 1901 and 26 Oct. 1902 by W. L. Abbott (field catalog; cf.

Miller, 1903a, p. 437; Lyon, 1916, p. 457); USNM, 4. FUS, B:IO-2.

Sibau, Sungai. See Poelau (?= Kuda), Sungai Sibau.

Siberut, Pulau, INDONESIA; 0°55′–1°48′S, 98°35′–99°18′E; *M. fascicularis* reported absent before 1928 by C. B. Kloss ([1928], p. 802). B:f.

Sibuga Besar, Sungai; *Borneo,* MALAYSIA: SABAH; ca. 5°56′N, 118°03′E; collected 21 Aug. 1929 by F. C. Wonder (field catalog; cf. Davis, 1962, p. 10); FMNH, 1. FAS; C:Sab-17.

Sibugal River. See Sibuga Besar, Sungai.

Si Chang, Ko, THAILAND; 13°07′–13°11′N, 100°48′–100°50′E; primates reported as apparently absent Jan. 1915 by C. B. Kloss (1915a, p. 157; 1915b, p. 221). *M. fascicularis* reported present 15 Nov. 1990 by local residents (Aggimarangsee, 1992, pp. 110, 130). Pending further information, Aggimarangsee's record is accepted as valid. Subspecies uncertain; A:T-31.

Sidjoendjoeng. See Sijunjung, Padang highlands.

Siemreab, 16 km S, 150 ft (= 45 m); CAMBODIA; 13°22′N, 103°51′E; collected 16 Dec. 1927 by J. Delacour (1929, p. 195) and W. P. Lowe; MNHN, 1. FAS; A:C-1.

Siem-Reap. See Siemreab.

Sijunjung, Padang highlands; *Sumatra,* INDONESIA; 0°42′S, 100°58′E; collected 21 Jul. 1877 by J. F. Snelleman (1887, p. 10; cf. Hooijer, 1962b, p. 44); RMNH, 1 (skull only). FAS; B:S-53.

Sika; *Pulau Flores,* Lesser Sunda Islands, INDONESIA; 8°45′S, 122°12′E; observed 21 Nov. 1888–9 Jan. 1889 by M. Weber (1890a, p. ix; 1890b, p. 102). FAS; C:LS-19.

Sikka. See Sika.

Sikundur; *Sumatra,* INDONESIA; ca. 4°00′N, 98°00′E; observed May–Dec. 1971 by J. R. MacKinnon (1973, p. 240). FAS; B:S-19.

Simalur Island. See *Simeulue, Pulau.*

Simeulue, Pulau, INDONESIA; 2°19′–2°55′N, 95°41′–96°30′E; collected 31 Jul. 1924 and 23 Dec. 1925 by unknown collectors; RMNH, 2 (skins only). Reported present before 1981 by J. T. Marshall (Crockett & Wilson, 1980, p. 156). Blood samples taken from captives 1984–1989 by W. Scheffrahn, J. R. de Ruiter, and J. A. R. A. M van Hooff (1994, p. 135). FUS; B:IO-2, IO-3.

Similajau National Park; *Borneo,* MALAYSIA: SARAWAK; ca. 3°38′N, 113°20′E; reported as probably present before 1983 by G. Davies ([1983], p. 148). FAS; C:Sar-15.

Simpang; *Pulau Bangka,* INDONESIA; 1°54′S, 105°26′E; collected in 1905 by B. Hagen; ZSBS, 1 (skin only). FAS; C:SCS-18.

Simujan River. See Simunjan, Sungai.

Simunjan, Sungai; *Borneo,* MALAYSIA: SARAWAK; ca. 1°17′N, 110°49′E; observed Aug. 1855 by A. R. Wallace (1869, pp. 69, 82). Collected 1876–1878 by W. T. Hornaday (1910, p. 358); museum unknown, 2 (not seen). FAS; C:Sar-7.

Simunjon River. See Simunjan, Sungai.

Sinabang; *Pulau Simeulue,* INDONESIA; 2°29′N, 96°23′E; collected 3–14 Feb. 1913 by E. Jacobson (1913, p. 356; 1917, p. 276) and W. C. V. Heurn; RMNH, 2 (skins only). Collected Jul. 1913 by E. Jacobson (1913, p. 356; 1917, p. 276); RMNH, 2 (skins only). FUS; B:IO-3.

Singapore Botanical Gardens; *Singapore Island,* SINGAPORE; 1°18′N, 103°49′E; collected 2 Apr. 1893 by unknown collector; ZRC, 1 (skin only, skull inside). Observed before 1901 by S. S. Flower (1900, p. 316). Collected 26 Jul. 1912 by unknown collector; ZRC, 1 (skin only). Collected 23 Mar. 1925 by museum collector; ZRC, 1. Collected Apr. 1925 by unknown collector; ZRC, 1 (skull only). Collected 11 Feb. 1944 by Oshita; ZRC, 1. Observed Jul.–Sep. 1960 by Y. Furuya (1961–1962a, p. 76; 1965, p. 289). Observed 29 Jul. 1973 by J. Fooden. FAS; B:SCS-7.

Singapore Island, northwestern part, mangroves, SINGAPORE; ca. 1°25′N, 103°44′E; reported present before 1974 by S. H. Chuang (1973, p. 3). FAS; B:SCS-7.

Singapore Island, western part, mangroves, SINGAPORE; ca. 1°20′N, 103°38′E; reported present before 1974 by S. H. Chuang (1973, p. 3). FAS; B:SCS-7.

Singapore Island, SINGAPORE; 1°16′–1°28′N, 103°38′–104°00′E; captive acquired Apr. 1858 by J. Zelabor ([1869], p. 8; cf. Fitzinger, 1861, p. 389) or von Frauenfeld. Collected [1870–1871] by A. B. Meyer (see Steenis-Kruseman, 1950, p. 358), ZMB, 1. Collected 22 Mar. 1903 by unknown collector; ZRC, 1. FAS; B:SCS-7.

Singkarak, Lake. See Pajo, Danau Singkarak, Balipor district.

Singkel vicinity; *Sumatra,* INDONESIA; ca. 2°17′N, 97°49′E; blood samples taken Nov.–Dec. 1986 by J. R. de Ruiter (1993, p. 91). FAS; B:S-17.

Singkil. See Singkel vicinity.

Singkil, Gunung; *Java,* west, INDONESIA; not located, 5°52′–7°48′S, 105°12′–108°52′E; collected 19–20 Jul. 1909 by H. W. van der Weele; RMNH, 3. FAS; B:J-8.

Sintang; *Borneo: Kalimantan,* INDONESIA;

0°04′N, 111°30′E; collected 14 Oct.–4 Nov. 1897 by A. Harrison, Jr., and H. M. Hiller; ANSP, 5 (including 2 skins only). FAS; C:K-7.

Sinubing; *Pulau Natuna Besar,* INDONESIA; not precisely located, 3°37′–4°13′N, 107°58′–108°25′E; collected Jul. 1894 by C. Hose; BM(NH), 1 (skin only, skull inside). FAS; B:SCS-32, SCS-33.

Siolak Daras. See Siulakderas, Kerinci region.

Sipora Island. See *Sipura, Pulau.*

Sipura, Pulau, INDONESIA; 2°02′–2°24′S, 99°32′–99°52′E; *M. fascicularis* reported absent before 1928 by C. B. Kloss ([1928], p. 802). B:g.

Si Racha vicinity; THAILAND; ca. 13°10′N, 100°56′E; observed Apr.–May 1912 by N. Gyldenstolpe (1914, p. 3). FAS; A:T-31.

Sirhassen Island. See *Serasan, Pulau.*

Sittwe harbor. See *Myengun Kyun.*

Siulakderas, Kerinci region, 3000 ft (= 900 m), *Sumatra,* INDONESIA; 1°55′S, 101°18′E; collected 27 Mar. 1914 by H. C. Robinson and C. B. Kloss (1918, p. 6; in Pendlebury, 1936, p. 9); BM(NH), 1. FAS; B:S-49.

Slamet, Mt. See Baturaden; Kaligoea.

Smitau. See Semitau, Sungai Kapuas.

Soekadono. See Sukadana.

Soekaranda; *Sumatra,* INDONESIA; not located, 5°38′N–5°57′S, 95°12′–106°05′E; collected Aug. 1894 by Ude; ZMB, 1 (skull only). FAS; not mapped.

Soengei Slan. See Sungaiselan.

Soengi Han. See Sungaiselan.

Soliga; *Pulau Nias,* INDONESIA; ca. 1°02′N, 97°33′E; collected 25 Jul. 1937 by B. Lawrence (see Schauensee & Ripley, 1940a, map following p. 368); MCZ, 2. FAS; B:IO-7.

Solombo, Pulau. See *Masalembu Besar, Pulau.*

Solor, Pulau, Lesser Sunda Islands, INDONESIA; 8°26′–8°37′S, 122°53′–123°11′E; reported present before 1937 by R. Mertens (1936, p. 319). FAS; C:LS-20.

Songkhla. See Khao Noi/Khao Tangkuan.

Sontra Peak, 0–300 m; VIETNAM; ca. 16°07′N, 108°18′E; observed Jun.–Aug. 1974 by L. K. Lippold (1977, p. 521). FAS; A:V-1.

Sontra Peak, 3.9 km W, 0.3 km S, 150–600 m; VIETNAM; ca. 16°07′N, 108°18′E; collected 14 Sep. 1967 by P. F. D. Van Peenen (see Van Peenen et al., 1969, pp. 100, 290; 1971, p. 134); USNM, 1. FAS; A:V-1.

South Andaman Island, INDIA; 11°29′–12°15′N, 92°31′–92°48′E; primates reported absent before 1903 by G. S. Miller, Jr. (1902b, p. 792; cf. Kloss, [1928], p. 802; Chaturvedi, 1980, p. 134). A:e.

South Banyuwangi Nature Park; *Java,* INDONESIA; ca. 8°37′S, 114°28′E; observed 17–28 Sep. 1971 by A. Hoogerwerf (1974, p. 24). FAS; C:J-43.

South Island. See *Pelapis Tengah, Pulau.*

South Pagi Island. See *Pagai Selatan, Pulau.*

South Sumatra Province. See Sumatera Selatan, Propinsi.

Sriracha. See Si Racha vicinity.

St. Barbe Island. See *Pejantan, Pulau.*

Straits of Malacca. See *Langkawi, Pulau.*

Suaka Margasatwa Padang Sugihan; *Sumatra,* INDONESIA; not located; observed Sep. 1988 by M. Bismark (1992, p. 11). FAS; not mapped.

Subi-kecil, Pulau, INDONESIA; 3°01′–3°03′N, 108°51′–108°53′E; collected 5 Aug. 1931 by P. M. de Fontaine (see Chasen, 1935a, p. 5); ZRC, 3. FAS; B:SCS-35.

Sugi, Pulau, Kepulauan Riau, INDONESIA; 0°45′–0°53′N, 103°43′–103°51′E; collected 24 Aug. 1902 by W. L. Abbott (see Miller, 1906c, p. 281); USNM, 1. FAS; B:SCS-16.

Suka Bandjar, northeast; *Sumatra,* INDONESIA; ca. 4°55′S, 104°02′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-77.

Suka Bandjar, southeast; *Sumatra,* INDONESIA; ca. 5°00′S, 103°57′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-77.

Sukadana, 100 m; *Sumatra,* INDONESIA; 5°05′S, 105°33′E; 29–30 Jul. 1934; collected by J. J. Menden; AMNH, 4. FAS; B:S-83.

Sulawesi, Pulau, INDONESIA; 1°45′N–5°43′S, 118°45′–125°15′E; introduced, reported present before 1841 by S. Müller ([1840], p. 17). Subspecies uncertain; not mapped.

Sullivan's Island. See *Lanbi Kyun.*

Sumatera Selatan, Propinsi (province); *Sumatra,* INDONESIA; 1°39′–4°53′S, 101°57′–106°11′E; blood samples taken Jan.–Nov. 1979 by Y. Kawamoto and Tb. M. Ischak (1981, p. 238). FAS; not mapped.

Sumatra, [east-central], INDONESIA; ca. 1°00′N, 101°00′E; collected ca. 1907 by M. Moszkowski (1909, maps following pp. 192, 328); ZMB, 4 (including 3 skulls only). FAS; B:S-40.

Sumatra, east coast, INDONESIA; 5°38′N–5°57′S, 95°12′–106°05′E; collected date unknown by H. Dürk; ZSBS, 15 (including 4 skins only, 4 skulls only). FAS; not mapped.

Sumatra, INDONESIA; 5°38′N–5°57′S, 95°12′–

106°05′E; collected 7 Sep. 1821 by A. Duvaucel; MNHN, 1 (skin only). Collected in 1889 by Dr. Moesch; ZMUZ, 1 (skin only, skull inside). Collected 1896-1897 by unknown collector; NMS, 2 (skulls only). Collected 10 Feb. and 5 Jun. 1897 by Petersen; ZMB, 2 (skulls only). Collected date unknown by Petersen; ZMB, 7 (including 4 skins only, 3 skulls only). Collected 1905–1910 by C. Bruegel; ZSBS, 52 (including 22 skins only, 11 skulls only). Collected date unknown by C. Bruegel; ZSBS, 1 (skin only). Collected in 1924 by P. Wirz; NHMBa, 2. Collected 10 Apr. 1926–18 Aug. 1930 by C. Blazer; RMNH, 4 (including 3 skulls only). Collected 3 Feb. 1938 by W. Groenvelt, RMNH, 1 (skull only). Collected before 1942 by L. Coomans de Ruiter; RMNH, 1 (skull only). Collected 3 May 1943 by unknown collector; USNM, 1. Collected date unknown by Dr. Porter; ZSBS, 1 (skull only). Collected date unknown by unknown collector; NMS, 2 (skulls only). FAS; not mapped.

Sumatra, south, INDONESIA; 5°38′N–5°57′S, 95°12′–106°05′E; collected date unknown by W. Volz; ZMB, 2 (skins only). FAS; not mapped.

Sumatra, west coast, INDONESIA; 5°38′N–5°57′S, 95°12′–106°05′E; collected before 1883 by F. von Faber; BM(NH), 1. FAS; not mapped.

Sumbawa, Pulau, Lesser Sunda Islands, INDONESIA; 8°05′–9°07′S, 116°42′–119°12′E; reported present before 1906 by T. Willink (1905, p. 175). Collected in 1914 by Dr. Pannekoek; NHMBa, 1 (skull only). FAS; C:LS-8, LS-10 through LS-12.

Sumbawang, Sungei. See Sembawang, Sungai.

Sunda Islands; INDONESIA; 5°38′N–10°23′S, 95°12′–127°18′E; collected in 1899 by P. Sarasin and F. Sarasin; NHMBa, 1 (skull only). Collected date unknown by von Altenstein; ZMB, 1 (skin only). FAS; not mapped.

Sundarbans. See Khulna district, Sundarbans.

Sungai Kayan-Sungai Mentarang Nature Reserve; *Borneo: Kalimantan,* INDONESIA; ca. 3°00′N, 115°30′E; reported present before 1983 by G. Davies ([1983], p. 148). FAS; C:K-36.

Sungai Kinabatangau. See Abai.

Sungailundang; *Sumatra,* INDONESIA; 1°05′S, 100°29′E; morphological study Jun.–Nov. 1980 by A. Bakar, M. Amir, and Marshal (1981, p. 11). FAS; B:S-47.

Sungaiselan; *Pulau Bangka,* INDONESIA; 2°24′S, 105°59′E; collected in 1900 by A. A. W. Hubrecht ([1895], pp. 33, 88; cf. Kohlbrugge, 1902, p. 322; Zuckerman, [1933], p. 1062); ZLUU, unspecified portion of Pulau Bangka collection (see *Bangka, Pulau*). FAS; B:SCS-19.

Sungai Tekam Forestry Concession, 250–350 m; MALAYSIA: WEST MALAYSIA; 4°10′N, 102°40′E; observed 1979–1981 by A. D. Johns (1981, p. 222). FAS; B:WM-12.

Sungei Adang; *Ko Tarutao,* THAILAND; not precisely located, 6°31′–6°44′N, 99°36′–99°42′E; collected 10–11 Mar. 1909 by museum collectors (see H. C. Robinson & Kloss, 1910, p. 666); BM(NH), 2. FAS; A:T-59.

Sungei Bernam. See Changkat Mentri.

Sungei Biru; *Pulau Bintan,* INDONESIA; ca. 1°12′N, 104°33′E; collected Jun.–Sep. 1908 by H. C. Robinson (in Thomas & Wroughton, 1909b, pp. 100, 104); BM(NH), 3; ZRC, 1 (skull only). FAS; B:SCS-8.

Sungei Buloh. See Kampong Sungai Buloh.

Sungei Hdang. See Sungei Adang.

Sungei Pandang. See Pandan, Sungai.

Sungsan, ca. 20 km NNE; *Sumatra,* INDONESIA; ca. 5°15′S, 105°50′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-85.

Sungsan, ca. 50 km N; *Sumatra,* INDONESIA; ca. 4°58′S, 105°48′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-84.

Suranadi; *Pulau Lombok,* Lesser Sunda Islands, INDONESIA; 8°33′S, 116°15′E; collected 10 Dec. 1981 by M. Aimi (pers. comm., 3 Aug. 1990; cf. Kawamoto et al., 1984, p. 132); PRI, 1 (skeleton only). Morphometric study Dec. 1981 by M. Aimi, A. Bakar, and J. Supriatna (1982, p. 52). Blood samples taken Jul. 1981–Jan. 1982 by Y. Kawamoto, Tb. M. Ischak, and J. Supriatna (1982, p. 58). FAS; C:LS-5.

Sur Sdei. See Pang Roloem–Sur Sdei area.

Survey Site LB, 5–50 m; *Pulau Simeulue,* INDONESIA; ca. 2°35′N, 96°10′E; 2 troops observed Jan. 1982 and 11 Mar.–3 Apr. 1984 by J. Sugardjito, C. P. van Schaik, N. A. van Noordwijk, and T. Mitrasetia (1989, p. 198). FUS; B:IO-2.

Survey Site LS, 10–120 m; *Pulau Simeulue,* INDONEISIA; ca. 2°44′N, 95°54′E; 2 troops observed Jan. 1982 and 11 Mar.–3 Apr. 1984 by J. Sugardjito, C. P. van Schaik, N. A. van Noordwijk, and T. Mitrasetia (1989, p. 198). FUS; B:IO-2.

Survey Site SEM, 210 m; *Pulau Simeulue,* INDONESIA; ca. 2°45′N, 96°02′E; 5 troops observed Jan. 1982 and 11 Mar.–3 Apr. 1984 by J. Sugardjito, C. P. van Schaik, N. A. van

Noordwijk, and T. Mitrasetia (1989, p. 198). FUS; B:IO-2.

Swela. See Sewela.

Syonan. See *Singapore Island,* SINGAPORE.

Tabanan. See Kukuh.

Tagoot (?= Tagu), Great Tenasserim River; BURMA; 12°15′N, 99°03′E; collected 18 Apr. 1914 by G. C. Shortridge (in Wroughton, 1915, p. 697; cf. Moore & Tate, 1965, p. 332); BNHS, 2. AUR; A:Bu-19.

Tahan, Sungai; MALAYSIA: WEST MALAYSIA; ca. 4°35′N, 102°18′E; observed Jul.–Sep. 1960 by Y. Furuya (1965, p. 287). FAS; B:WM-11.

Tahang River. See Tahan, Sungai.

Takengon, ca. 15 km NNW; *Sumatra,* INDONESIA; ca. 4°45′N, 96°47′E; reported present Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). FAS; B:S-9.

Takengon, ca. 40 km NNW; *Sumatra,* INDONESIA; ca. 4°58′N, 96°42′E; reported present Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). FAS; B:S-8.

Takokak Reserve; *Java,* INDONESIA; ca. 7°03′S, 106°59′E; reported present before 1972 by unspecified informant (IUCN, 1971, p. 276). FAS; B:J-8.

Tale Sap. See Nang Kham, Ko.

Talibang, near Kota Kinabalu, near sea level; *Borneo,* MALAYSIA: SABAH; ca. 6°11′N, 116°14′E; collected 15–24 Aug. 1937 by J. A. Griswold, Jr. (see Coolidge, 1940, p. 123); MCZ, 4 (including 1 skeleton only). FAS; C:Sab-5.

Talibong. See Talibang.

Talibong, Ko, northwest, THAILAND; ca. 7°17′N, 99°23′E; Collected 3 Jan. 1917 by H. C. Robinson (1917, p. 132); ZRC, 1. FAS; A:T-56.

Talibong, Ko, THAILAND; 7°12′–7°17′N, 99°22′–99°27′E; collected 27 Feb. 1896 by W. L. Abbott (see Riley, 1938, p. 12); USNM, 1. FAS; A:T-56.

Tamandjaija, Bantam region; *Java,* INDONESIA; 6°52′–7°00′S, 105°12′–106°33′E; collected 15 Jan. 1910 by O. Bryant; MCZ, 1. FAS; B:J-12.

Taman Negara. See Negara, Taman.

Taman Rimba Templer. See Templer Park.

Tamansari, 1600 ft (= 490 m); *Java,* INDONESIA; 7°57′S, 111°31′E; collected 20 Jan. 1920 by C. B. Kloss (see Weitzel et al., 1988, p. 144); BM(NH), 1; ZRC, 1. FAS; C:J-31.

Tambelan Besar, Pulau, INDONESIA; 0°57′–1°02′N, 107°32′–107°36′E; observed 8–15 Aug. 1899 by W. L. Abbott (in Miller, 1900, p. 244; cf. Kloss, 1903b, p. 62). FAS; B:SCS-26.

Tambelan Islands. See *Benua, Pulau*; *Uwi, Pulau.*

Tamiang; *Sumatra,* northeast, INDONESIA; ca. 4°25′N, 98°16′E; collected Nov. 1931 by H. J. V. Sody (see Hooijer, 1962b, p. 45); RMNH, 1 (skull only). FAS; B:S-18.

Tana Bala. See *Tanahbala, Pulau.*

Tanahbala, Pulau, INDONESIA; 0°15′–0°37′S, 98°17′–98°30′E; collected 4 Feb. 1903 by W. L. Abbott (see Lyon, 1916, p. 459); USNM, 2. Reported Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). FAS; B:IO-13.

Tanah Laut. See Pleihari Tanah Laut Game Sanctuary.

Tanahmasa, Pulau, INDONESIA; 0°01′N–0°23′S, 98°17′–98°34′E; collected 19 Feb. 1903 by W. L. Abbott; USNM, 1 (skull only). FAS; B:IO-12.

Tanah Puteh. See Kampong Tanah Puteh.

Tandjong. See Tanjung.

Tandjung; *Sumatra,* INDONESIA; ca. 3°17′N, 99°19′E; collected 1897–1899 by G. Schneider (1905, p. 72); museum and number of specimens unknown (not seen). FAS; B:S-23.

Tandjung Bringin; *Sumatra,* INDONESIA; ca. 3°47′N, 98°24′E; collected 1897–1899 by G. Schneider (1905, p. 72); museum and number of specimens unknown (not seen). FAS; B:S-20.

Tandjung Butus; *Sumatra,* INDONESIA; ca. 3°47′N, 98°24′E; collected 1897–1899 by G. Schneider (1905, p. 72); museum and number of specimens unknown (not seen). FAS; B:S-20.

Tandjung Laut. See Tandjung.

Tangarveng Island, Sungai Mahakam; *Borneo: Kalimantan,* INDONESIA; ca. 0°24′S, 116°58′E; collected 21 Jun. 1912 by H. C. Raven (see Deignan, [1960], p. 267); USNM, 1. FAS; C:K-49.

Tanjang Sau. See Tanjong Sauh.

Tanjang Turut. See Tanjong Turut.

Tanjong Batu. See Batu, Tanjung.

Tanjong Pamuju. See Pamuja, Tanjung.

Tanjong Panjair, Sungai Rompin; MALAYSIA: WEST MALAYSIA; ca. 2°49′N, 103°29′E; collected 2 Sep. 1919 by museum collector; BM(NH), 1; ZRC, 1. FAS; B:WM-22.

Tanjong Rengsam. See Rengsam, Tanjung.

Tanjong Sauh; *Pulau Batam,* east coast, Kepulauan Riau, INDONESIA; ca. 1°07′N, 104°09′E; collected 10–11 Jul. 1908 by H. C. Robinson (in Thomas & Wroughton, 1909b, p. 104) and E. Seimund; BM(NH), 1; BNHS, 1. FAS; B:SCS-10.

Tanjong Tuan, Keramat; MALAYSIA: WEST MALAYSIA; 2°24′N, 101°52′E; collected 6 Apr. 1920 by unknown collector; ZRC, 1. Observed

Aug.–Dec. 1970 by C. H. Southwick and F. C. Cadigan, Jr. (1972, p. 13). FAS; B:WM-24.

Tanjong Turut; *Pulau Batam,* east coast, Kepulauan Riau, INDONESIA; ca. 1°07′N, 104°09°E; collected 12 Jul. 1908 by H. C. Robinson (in Thomas & Wroughton, 1909b, p. 104) and E. Seimund; BM(NH), 2. FAS; B:SCS-10.

Tanjung; *Borneo: Kalimantan,* southeast, INDONESIA; 2°11′S, 115°23′E; collected in 1905 by A. Buxtorf; NHMBa, 1 (skull only). FAS; C:K-30.

Tanjungmorawa, Kabupaten Deli Serdang; *Sumatra,* INDONESIA; 3°31′N, 98°49′E; collected in 1882 and 1883 by B. Hagen (1890, p. 81); RMNH, 3 (including 2 skulls only, 1 skeleton only). Collected in 1906 and date unknown by C. Bruegel; ZSBS, 8 (including 3 skins only, 3 skulls only). Collected 9 Jan. 1908 by L. Weigand; ZSBS, 1. FAS; B:S-21.

Tanjung Puting National Park; *Borneo: Kalimantan,* INDONESIA; 2°45′–2°48′S, 111°57′–112°01′E; reported present Dec. 1974–Jul. 1975 by J. Supriatna, B. O. Manullang, and E. Soekara (1986, p. 186). Reported present before 1983 by G. Davies ([1983], p. 148). Observed in 1983 by K. S. MacKinnon (1986, p. 112). FAS; :K-10.

Tapanuli, Teluk; *Sumatra,* west, INDONESIA; 1°38′N, 98°45′E; collected 21 Feb. and 19 Mar. 1902 by W. L. Abbott (see Miller, 1903a, p. 438); USNM, 2. FAS; B:S-32.

Tapanuli Bay. See Tapanuli, Teluk.

Tapung-kanan, Sungai; *Sumatra,* INDONESIA; 0°46′N, 101°06′E; collected ca. 1907 by M. Moszkowski (1909, p. 149); ZMB, 1. FAS B:S-41.

Tarusan, Teluk; *Sumatra,* INDONESIA; 1°13′S, 100°25′E; collected 27 Dec. 1904 by W. L. Abbott; USNM, 1. FAS; B:S-47.

Tarusan Bay. See Tarusan, Teluk.

Tarutao, Ko, THAILAND; 6°31′–6°44′N; 99°36′–99°42′E; collected 19 Nov. 1903 and 10 Apr. 1904 by W. L. Abbott (see H. C. Robinson & Kloss, 1910, p. 666; Riley, 1938, p. 15); USNM, 3 (including 1 skull only). FAS; A:T-59.

Tasikmalaja. Tasikmalaya.

Tasikmalaya; *Java,* INDONESIA; 7°20′S, 108°12′E; collected Apr.–Aug. 1926 by Dr. Kopstein; MZB, 7 (including 1 skin only). FAS; B:J-4.

Tasikmalaya, Preanger region, 1145 ft (= 350 m); *Java,* INDONESIA; ca. 7°20′S, 108°12′E; collected 18 Jan. 1908 by G. C. Shortridge (see Thomas & Wroughton, 1909a, p. 373); BM(NH), 1. FAS; B:J-4.

Tatawa, Pulau, Lesser Sunda Islands, INDONESIA; 8°30′–8°31′S, 119°38′–119°39′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). C:d.

Taungbyauk Chaung, Tavoy River, Tavoy district; BURMA; ca. 13°45′N, 98°26′E; collected 29–30 Apr. 1936 by H. C. Smith; BM(NH), 4. AUR; A:Bu-14.

Tavoy River, mouth, Tavoy district; BURMA; 14°02′N, 98°12′E; collected 21 Apr. 1936 by H. C. Smith; BM(NH), 2. AUR; A:Bu-13.

Tawao. See Tawau.

Tawar-See. See Bur ni Bebuli.

Tawau; *Borneo,* MALAYSIA: SABAH; 4°15′N, 117°54′E; collected 2 Jan. 1910 by R. C. Andrews (1943, p. 69); AMNH, 1. FAS; C:Sab-24.

Tawau Hills National Park; *Borneo,* MALAYSIA: SABAH; ca. 4°20′N, 118°00′E; reported present before 1983 by G. Davies ([1983], p. 148). FAS; C:Sab-23.

Tay Ninh, 100 m; VIETNAM; 11°18′N, 106°06′E; collected 19 Jan. 1928 by J. Delacour (1928, p. 268; 1929, p. 196) and W. P. Lowe; BM(NH), 1 (skin only). FAS; A:V-5.

Tebingtinggi, ca. 25 km SSE; *Sumatra,* INDONESIA; ca. 3°07′N, 99°15′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-23.

Tebingtinggi, ca. 35 km ESE; *Sumatra,* INDONESIA; ca. 3°10′N, 99°25′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-23.

Tebingtinggi, ca. 55 km ESE; *Sumatra,* INDONESIA; ca. 3°04′N, 99°36′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-24.

Tebingtinggi, ca. 60 km SSW; *Sumatra,* INDONESIA; ca. 2°54′N, 99°00′E; reported present Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). FAS; B:S-30.

Tebingtinggi, ca. 65 km SE; *Sumatra,* INDONESIA; ca. 2°58′N, 99°38′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-24.

Tebingtinggi, ca. 75 km SE; *Sumatra,* INDONESIA; ca. 2°54′N, 99°42′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-24.

Tebingtinggi, ca. 75 km SSW; *Sumatra,* INDONESIA; ca. 2°43′N, 98°53′E; reported present Nov. 1971–Jan. 1973 by local residents (Crockett & Wilson, 1980, p. 156). FAS; B:S-29.

Tebingtinggi vicinity; *Sumatra,* INDONESIA; ca. 3°20′N, 99°09′E; observed Nov. 1971–Jan. 1973

by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-23.

Tekek; *Pulau Tioman,* MALAYSIA: WEST MALAYSIA; ca. 2°49′N, 104°10′E; observed Mar.–Apr. 1962 by Lord Medway (1966, p. 16). FAS; B:SCS-3.

Telaga, Pulau, INDONESIA; 3°01′–3°05′N, 105°58′–105°59′E; observed 13–16 Sep. 1899 by W. L. Abbott (in Miller, 1900, p. 245; cf. Kloss, 1903b, p. 73). FAS; B:SCS-29.

Telang, 20 m; *Borneo: Kalimantan,* INDONESIA; 2°30′S, 115°24′E; collected 15 Feb. 1971 by NAMRU 2 Djakarta Detachment (see Van Peenen et al., 1974, p. 392); USNM, 1. FAS; C:K-29.

Telapa Burok, Gunong. See Telapak Burok, Gunong.

Telapak Burok, Gunong, 605–1060 m; MALAYSIA: WEST MALAYSIA; 2°49′N, 102°04′E; reported as probably present Jul. 1978–Jun. 1981 by C. W. Marsh and W. L. Wilson (1981, p. 232). FAS; B:WM-23.

Telibon Island. See *Talibong, Ko,* THAILAND.

Telok Anson, near sea level; MALAYSIA: WEST MALAYSIA; 4°02′N, 101°01′E; collected 27 Apr. 1915 by N. Gyldenstolpe (1917a, p. 5); NHRM, 2 (skulls only; skins reported by Gyldenstolpe, 1917a, p. 25). FAS; B:WM-16.

Telok Bahang; *Pulau Pinang [1],* MALAYSIA: WEST MALAYSIA; 5°28′N, 100°13′E; collected 12 Mar.–3 Apr. 1911 by E. Seimund (see Weitzel et al., 1988, p. 102); BM(NH), 1; ZRC, 6. FAS; B:SM-2.

Telok Betong. See Telukbetung.

Telok Dalam. See Dalam, Lhok.

Telok Paanji. See Telukpanji, Kotapinang region.

Telok Wau; *Ko Tarutao,* west coast, THAILAND; ca. 6°35′N, 99°35′E; collected 25–28 Dec. 1916 by H. C. Robinson (1917, p. 132); BM(NH), 1; ZRC, 1. FAS; A:T-59.

Telom, Sungai, 400 ft (= 120 m); MALAYSIA: WEST MALAYSIA; ca. 4°18′N, 101°48′E; collected 4 Mar. 1932 by F. A. B. Holloway and A. S. Vernay; BM(NH), 2. FAS; B:WM-8.

Teluk Anson. See Telok Anson.

Telukbetung; *Sumatra,* INDONESIA; 5°27′S, 105°16′E; collected before 1907 by W. Denna (see Elliot, 1906, p. 49); FMNH, 1. Clinical examination Aug.–Nov. 1980 by K. Matsubayashi and D. Sajuthi (1981, p. 48). FAS; B:S-82.

Teluk Jolo, 12 km N; *Borneo: Kalimantan,* INDONESIA; ca. 0°18′S, 114°03′E; observed 27–28 Aug. 1986 by D. J. Chivers and K. M. Burton ([1991], p. 143). FAS; C:K-19.

Telukkayubutih, ca. 15 km E; *Sumatra,* INDONESIA; ca. 1°09′S, 102°06′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-51.

Telukkayubutih, ca. 15 km NNE; *Sumatra,* INDONESIA; ca. 1°06′S, 102°02′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-51.

Telukkayubutih, ca. 15 km WNW; *Sumatra,* INDONESIA; ca. 1°06′S, 101°52′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-51.

Telukkayubutih, ca. 30 km ESE; *Sumatra,* INDONESIA; ca. 1°12′S, 102°13′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-51.

Telukkayubutih, ca. 30 km WNW; *Sumatra,* INDONESIA; ca. 1°06′S, 101°44′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-51.

Telukkayubutih, ca. 45 km ESE; *Sumatra,* INDONESIA; ca. 1°18′S, 102°18′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-51.

Telukkayubutih, ca. 60 km SE; *Sumatra,* INDONESIA; ca. 1°23′S, 102°21′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-51.

Telukkayubutih vicinity; *Sumatra,* INDONESIA; 1°11′S, 101°59′E; observed Nov. 1971–Jan. 1973 by C. M. Crockett and W. L. Wilson (1980, p. 156). FAS; B:S-51.

Telukpanji, Kotapinang region; *Sumatra,* INDONESIA; 2°02′N, 100°14′E; collected 6 Jun. 1937 by M. Boogaarts; ZRC, 1. FAS; B:S-36.

Teluk Terima. See Trima, Teluk.

Temaju, Pulau, INDONESIA; 0°28′–0°31′N, 108°51′–108°52′E; monkeys reported absent 5–6 May 1907 by W. L. Abbott (in Lyon, 1911, p. 59). B:n.

Tembeling, Sungai; MALAYSIA: WEST MALAYSIA; ca. 4°30′N, 102°15′E; observed Jul.–Sep. 1960 by Y. Furuya (1965, p. 287). FAS; B:WM-11.

Tempasuk, Sungai, Kampong Kiau region, Mount Kinabalu, ca. 2000 ft (= 600 m); *Borneo,* MALAYSIA: SABAH; ca. 6°05′N, 116°27′E; collected 9 Aug. 1937 by J. A. Griswold, Jr. (1939b, p. 514); MCZ, 1. FAS; C:Sab-7.

Templer Park, west section, near waterfall; MALAYSIA: WEST MALAYSIA; ca. 3°18′N, 101°36′E; observed before 1972 by M. Nadchatram (1971, p. 147). FAS; B:WM-19.

Tenasserim; BURMA; 12°05′N, 99°01′E; collect-

ed 4 Mar.–9 Apr. 1914 by G. C. Shortridge (in Wroughton, 1915, p. 696); BM(NH), 5 (including 1 skull only); BNHS, 3; FMNH, 1; ZRC, 3. AUR; A:Bu-19.

Tenasserim River. See Great Tenasserim River and Tagoot (?= Tagu), Great Tenasserim River.

Tengger, Pegunungan, 4000 ft (= 1200 m); *Java,* INDONESIA; 7°55′S, 112°55′E; collected before 1897 by J. H. F. Kohlbrugge (1896b, p. 280); museum unknown, 1 (not examined). FAS; C:J-36.

Tenghilan Road. See Tuaran-Kampong Tenghilan Road.

Tengi, Sungai, 5 m; MALAYSIA: WEST MALAYSIA; 3°31′N, 101°17′E; observed Jul. 1978–Jun. 1981 by C. W. Marsh and W. L. Wilson (1981, p. 232). FAS; B:WM-18.

Tenompok, 4700 ft (= 1430 m) and 4900 ft (= 1490 m); *Borneo,* MALAYSIA: SABAH; ca. 6°00′N, 116°32′E; collected 6–29 Jun. 1937 by J. A. Griswold, Jr. (1939a, p. 410); MCZ, 2. FAS; C:Sab-7.

Tenompok Pass. See Kampong Kiau-Tenampok Pass, trail between.

Terbanjawan; *Sumatra,* INDONESIA; ca. 3°32′N, 98°38′E; collected 1897–1899 by G. Schneider (1905, p. 72); museum and number of specimens unknown (not seen). FAS; B:S-21.

Terengganu, Sungai, vicinity; MALAYSIA: WEST MALAYSIA; ca. 5°00′N, 103°00′E; reported present in 1968 by D. Chivers (1971, p. 80). FAS; B:WM-10.

Terima, Teluk. See Trima, Teluk.

Teris, Sungai, ca. 3 km S of Bukit Tapah; MALAYSIA: WEST MALAYSIA; ca. 3°35′N, 102°11′E; observed Jul.–Dec. 1977 by D. Chivers and G. Davies (1979, p. 20). FAS; B:WM-15.

Terutau, Pulo. See *Tarutao, Ko.*

Thaget. See Thagyet, Little Tenasserim River.

Thagyet, Little Tenasserim River; BURMA; 12°06′N, 99°07′E; collected 25 Mar. 1914 by G. C. Shortridge (in Wroughton, 1915, p. 697); BM(NH), 2; BNHS, 3; FMNH, 1; ZRC, 1. AUR/FAS/MUL; A:Bu-19.

THAILAND; 5°37′–17°48′N, 97°21′–105°39′E; collected 1858–1861 by H. Mouhot (1864, map at end of vol. 2); BM(NH), 1. Collected in 1862 and 1869 by M. Boucourt; MNHN, 2 (skins only, skulls inside). Collected in 1906 by C. Bruegel; ZSBS, 4 (including 1 skin only, 2 skulls only). Collected date unknown by Dr. Bulkley; AMNH, 1 (skin only). Subspecies uncertain; not mapped.

Tham Chomphon; THAILAND; 13°37′N, 99°36′E; blood samples taken Aug.–Sep. 1988 by Y. Kawamoto, T. Ishida, J. Suzuki, O. Takenaka, and P. Varavudhi (1989, p. 95). Observed 20 Dec. 1990 by N. Aggimarangsee (1992, pp. 111, 127, pers. comm., Oct. 1993). FAS; A:T-28.

Tham Chompol. See Tham Chomphon.

Tham Hom, 4 km W of Ban Thap Plik, ca. 75 m; THAILAND; ca. 8°11′N, 98°53′E; collected 3 Jun. 1973 by J. Fooden ([1975], p. 98); FMNH, 1. FAS; A:T-60.

Thap Salao, Huai, 200 m; THAILAND; 15°38′N, 99°18′E; observed 15 Jul. 1977 by A. A. Eudey (1979, pp. 90, 198). Subspecies uncertain; A:T-19.

Thateng, Muang, Plateau des Bolovens; LAOS; 15°26′N, 106°23′E; collected 29 Jan.–13 Feb. 1932 by T. D. Carter (see Legendre, 1932, p. 495; 1936, p. 251); AMNH, 3 (including 2 skins only); ANSP, 2 (external measurements recorded in AMNH catalog). AUR/FAS/MUL; A:L-1.

Thung Thong Waterfowl Reserve; THAILAND; 8°50′N, 99°15′E; observed 22 Jul. 1976–11 Mar. 1977 by P. J. Storer (1978, p. 113). AUR/FAS/MUL; A:T-48.

Tibang, Mt.; *Borneo: Kalimantan,* INDONESIA; 1°39′N, 114°34′E; collected Nov. 1925 by E. Mjöberg (1929, p. 117); MCZ, 1. FAS; C:K-34.

Tikus, Pulu, Cocos Islands, AUSTRALIA; 12°06′S, 96°54′E; introduced Jun. 1905–Sep. 1906, species identification tentative (F. W. Jones, 1910, p. 298). Subspecies uncertain; not mapped.

Tillanchong Island, Nicobar Islands, INDIA; 8°26′–8°35′N, 93°37′–93°39′E; primates reported absent before 1903 by G. S. Miller, Jr. (1902b, p. 792; cf. Kloss, 1903a, p. 114). A:j.

Tilu, Gunung; *Java,* west, INDONESIA; 7°33′S, 107°57′E; collected 6 May 1910 by H. W. van der Weele; RMNH, 1. FAS; B:J-5.

Timau, Fatu, northeast, 1200 m; *Pulau Timor,* Lesser Sunda Islands, INDONESIA; ca. 9°35′S, 123°55′E; collected 20 May 1911 by C. B. Haniel (see Hellmayr, 1914, p. 5); ZSBS, 1. FAS; C:LS-26.

Timor, Pulau, Lesser Sunda Islands, INDONESIA; 8°19′–10°23′S, 123°27′–27°18′E; obtained ca. 1846 by W. H. Benson (Blyth, 1846, p. 367; J. Anderson, 1881, p. 65); skin and skull formerly preserved in ZSI (not seen). Reported present ca. 1856 by A. R. Wallace (1869, p. 326). Collected in 1890 by B. Hagen; NHMBa, 1 (skull only). FAS; C:LS-25 through LS-29.

Tinggi, Pulau, MALAYSIA: WEST MALAYSIA 2°17′–2°19′N, 104°06′–104°08′E; collected 24–25 Jun. 1908 by H. C. Robinson (in Thomas & Wroughton, 1909b, p. 103; cf. H. C. Robinson, 1919, p. 325) and E. Seimund; BM(NH), 3; ZRC, 1. Collected 17 Jun. 1915 by V. Knight; ZRC, 1. FAS; B:SCS-6.

Tingilan Road. See Tuaran-Kampong Tenghilan Road.

Tinjil, Pulau, INDONESIA; 6°57′–6°58′S, 105°46′–105°49′E; introduced Feb. 1988–Jun. 1990 (Kyes et al., 1991, p. 114; 1993, p. 78). Subspecies uncertain; not mapped.

Tinonkok, Kampong Kiau region, Mount Kinabalu, ca. 2200 ft (= 670 m); *Borneo,* MALAYSIA: SABAH; ca. 6°02′N, 116°31′E; collected 23 Aug. 1937 by J. A. Griswold, Jr. (1939b, p. 514); MCZ, 1. FAS; C:Sab-7.

Tioman, Pulau, MALAYSIA: WEST MALAYSIA; 2°43′–2°53′N, 104°07′–104°13′E; collected 4 Oct. 1899 by W. L. Abbott (see Miller, 1900, pp. 203, 246; Riley, 1938, p. 14); USNM, 1. Collected 20 Jun. 1916 by C. B. Kloss; BM(NH) (skin)/ ZRC (skull). Examined for malaria Sep. 1961 and Apr. 1962 by McW. Warren (1966, p. 156). FAS; B:SCS-3.

Tjarmara. See Camara.

Tjandiroto. See Candiroto.

Tjempaga. See Parit.

Tjerimai. See Ciremay, Gunung.

Tjeringin, near Banjar, Preanger region, east; *Java,* INDONESIA; ca. 7°22′S, 108°32′E; collected date unknown by H. J. V. Sody; RMNH, 4 (including 1 skull only). FAS; B:J-3.

Tjihara. See Cihara; Pelabuhanratu, Teluk, Bantam region.

Tjikaran, Walde. See Cikarang forest.

Tjikoedjang. See Cikujang.

Tji-Tandoei River. See Kalipucang, Ci Tanduy.

Tji Wangie. See Ciwangi.

Tk. Nipah. See Nipah, Telok, vicinity.

Toeroek Tjahoe. See Purukcahu, Sungai Barito.

Trang Bom. See Xa Trang Bom.

Trima, Teluk; *Pulau Bali,* Lesser Sunda Islands, INDONESIA; 8°08′S, 114°32′E; blood samples taken in 1980 by Y. Kawamoto, K. Nozawa, and Tb. M. Ischak (1981, p. 16). FAS; C:LS-1.

Trinkat Island, Nicobar Islands, INDIA; 8°02′–8°08′N, 93°34′–93°37′E; primates reported absent before 1903 by G. S. Miller, Jr. (1902b, p. 792; cf. Kloss, 1903a, p. 114). A:1.

Trinkut Island. See *Trinkat Island.*

Trong. See Ban Phra Muang; Tyching.

Trusan Kinabatangan; *Borneo,* MALAYSIA: SABAH; ca. 5°49′N, 118°20′E; observed May–Jun. 1950 by D. D. Davis (1962, pp. 57, 127, pl. 21). FAS; C:Sab-19.

Tuangku, Pulau, INDONESIA; 2°02′–2°14′N, 97°07′–97°22′E; blood samples taken Nov.–Dec. 1986 by J. R. de Ruiter (1993, p. 91). FAS; B:IO-5.

Tuangku, Pulau, north coast; INDONESIA; ca. 2°13′N, 97°14′E; collected 24–28 Jan. 1902 by W. L. Abbott (field catalog; cf. Miller, 1903a, p. 438); USNM, 5 (including 2 skulls only; external measurement recorded on tag of one of these skulls). FAS; B:IO-5.

Tuan Keramat, Tanjong. See Tanjong Tuan, Keramat.

Tuanku, Pulau. See *Tuangku, Pulau.*

Tuanku, Pulo. See *Tuangku, Pulau.*

Tuaran, near Kota Kinabalu, near sea level; *Borneo,* MALAYSIA: SABAH; 6°11′N, 116°14′E; collected 24 Jul. 1937 by J. A. Griswold, Jr. (see Coolidge, 1940, p. 123); MCZ, 2 (male skin mismatched with female skull). FAS; C:Sab-5.

Tuaran-Kampong Tenghilan Road, new bridge, near sea level; *Borneo,* MALAYSIA: SABAH; ca. 6°08′N, 116°15′E; collected 29 Jul.–8 Aug. 1937 by J. A. Griswold, Jr. (see Coolidge, 1940, p. 123); MCZ, 4. FAS; C:Sab-5.

Tulungagung; *Java,* INDONESIA; 8°04′S, 111°54′E; collected ca. 1895 by E. Dubois; RMNH, 6 (skulls only). FAS; C:J-32.

Tum Chompol. See Tham Chomphon.

Tunggal, Bukit, 10 m; MALAYSIA: WEST MALAYSIA; 3°32′N, 101°27′E; observed Jul. 1978–Jun. 1981 by C. W. Marsh and W. L. Wilson (1981, p. 232). FAS; B:WM-18.

Tyching; THAILAND; 7°33′N, 99°35′E; collected 19 May 1896 by W. L. Abbott (see Riley, 1938, p. 12); USNM, 2. FAS; A:T-61.

Ubud; *Pulau Bali,* Lesser Sunda Islands, INDONESIA; 8°30′S, 115°16′E; observed 21 Sep.–3 Oct. 1980 by N. Koyama, A. Asuan, and N. Natsir (1981, p. 1). Observed in 1986, 1990, 1991, and 1992 by B. P. Wheatley and D. K. Harya Putra (1994, p. 246). FAS; C:LS-3.

Udon Thani, S; THAILAND; ca. 17°10′N, 102°50′E; unconfirmed report, source unspecified, cited by Varavudhi et al. (1992, p. 338; cf. Fooden, 1971, p. 28; 1982, p. 576; Aggimarangsee, 1992, p. 119). Not mapped.

Udjung Kulon National Park. See Ujungkulon, Suaka Margasatwa.

Ujungkulon, Suaka Margasatwa; *Java,* INDO-

NESIA; 6°39′–6°53′S, 105°12′–105°30′E; observed Sep. 1940–Jul. 1955 by A. Hoogerwerf (1970, p. 408). Reported present ca. 1961 by R. K. P. Satmoko (1961, p. 117). Observed Sep. 1969–Jan. 1971) by W. Angst (1973, p. 626; 1975, p. 326). Observed summer 1982 by G. Hohmann and W. P. Peter (1983, p. 44). FAS; B:J-14.

Ulu, Sungai; *Pulau Natuna Besar,* INDONESIA; 3°53′N, 108°24′E; collected 25 Apr. 1909 by V. Knight (see Chasen, 1935a, p. 5); ZRC, 1 (skull not examined). FAS; B:SCS-32.

Ulu Gombak Forest Reserve; MALAYSIA: WEST MALAYSIA; ca. 3°18′N, 101°47′E; observed Aug. 1962 by R. H. Wharton, D. E. Eyles, McW. Warren, and W. H. Cheong (1964, p. 59). FAS; B:WM-19.

Ulu Ijok, 400 ft (= 120 m); MALAYSIA: WEST MALAYSIA; 5°08′N, 100°48′E; collected 27–30 Dec. 1930 by A. B. Holloway and A. S. Vernay (see P. H. Napier, 1981, p. 14); BM(NH), 2. FAS; B:WM-5.

Ulu Sebol. See Sekol, Sungai.

Ulu Segama Reserve; *Borneo,* MALAYSIA: SABAH; ca. 5°10′N, 117°54′E; observed Jun.–Oct. 1968 and Oct. 1969–Oct. 1970 by J. R. MacKinnon (1971, p. 153). FAS; C:Sab-13.

Um Pang. See Wong, Nam Mae.

Ungar, Pulau, Kepulauan Riau, INDONESIA; 0°37′–0°42′N, 103°28′–103°32′E; reported present Jun.–Aug. 1903 by W. L. Abbott (see Miller, 1906c, p. 279). FAS; B:SCS-16.

Unter Langkat district; *Sumatra,* INDONESIA; ca. 3°55′N, 98°20′E; collected 1897–1899 by G. Schneider (1905, p. 72); museum and number of specimens unknown (not seen). FAS; B:S-20.

Uwi, Pulau, INDONESIA; 1°04′–1°07′N, 107°22′–107°25′E; collected 13 Aug. 1899 by W. L. Abbott (in Miller, 1900, p. 244; cf. Kloss, 1903b, p. 65; Oberholser, 1919, p. 129); USNM, 1. FAS; B:SCS-26.

Vadju, Nusa, Komodo area, Lesser Sunda Islands, INDONESIA; not located, ca. 8°30′S, 119°30′E; monkeys reported absent 1969–1973 by W. Auffenberg (1981, p. 40). Not mapped.

Ven-Ven (?= Mae Nam Welu); THAILAND; ca. 12°20′N, 102°20′E; observed 1–4 Mar. 1859 by H. Mouhot (1864, vol. 1, p. 152). FAS; A:T-34.

Verlaten Island. See *Sertung, Pulau.*

Victoria Island. See *Ru, Pulo.*

Wai, Pulo. See *Uwi, Pulau.*

Wai Sano. See Sano, Wai.

Walde Tjikaran. See Cikarang forest.

Wang Kaew; THAILAND; ca. 12°47′N, 101°39′E; blood samples taken Aug.–Sep. 1988 by Y. Kawamoto, T. Ishida, J. Suzuki, O. Takenaka, and P. Varavudhi (1989, p. 95). FAS; A:T-32.

Wat (= Temple) Ban Kan Yai; THAILAND; 15°21′N, 104°13′E; observed 14 Jul. 1989 by N. Aggimarangsee (1992, pp. 109, 122; pers. comm., Oct. 1993). Subspecies uncertain; A:T-17.

Wat Ban Muang Khan. See Wat Ban Kan Yai.

Wat Ban Rai Don; THAILAND; 13°07′N, 99°50′E; reported present 20 Aug. 1989 by local nun (Aggimarangsee, 1992, pp. 110, 132; pers. comm., Oct. 1993). Subspecies uncertain; A:T-37.

Wat Bun Thawi; THAILAND; 13°08′N, 99°56′E; observed 18 Aug. 1989 and 11 Feb. 1991 by N. Aggimarangsee (1992, pp. 109, 112, 131; pers. comm., Oct. 1993). Subspecies uncertain; A:T-37.

Wat Cha-Am Kiri; THAILAND; 13°48′N, 99°53′E; reported by local residents as exterminated ca. 1980 (Aggimarangsee, 1992, pp. 110, 134; pers. comm., Oct. 1993). FAS; A:T-28.

Wat Huai Takhaeng; THAILAND; 13°35′N, 99°46′E; blood samples taken Aug.–Sep. 1988 by Y. Kawamoto, T. Ishida, J. Suzuki, O. Takenaka, and P. Varavudhi (1989, p. 95). Observed 20 Dec. 1990 by N. Aggimarangsee (1992, pp. 111, 128; pers. comm., Oct. 1993). FAS; A:T-28.

Wat Khao Bandai It; THAILAND; 13°06′N, 99°56′E; observed 10–11 Aug. 1989 and 11 Feb. 1991 by N. Aggimarangsee (1992, pp. 109, 112, 131; pers. comm., Oct. 1993). Subspecies uncertain; A:T-37.

Wat Khao Chong Phran; THAILAND; 13°43′N, 99°46′E; observed 20 Dec. 1990 by N. Aggimarangsee (1992, pp. 111, 127; pers. comm., Oct. 1993). FAS; A:T-28.

Wat Khao Khang. See Wat Ngern Rung Sawang.

Wat Khao Khan Hok; THAILAND; 13°50′N, 99°38′E; observed 22 Dec. 1990 by N. Aggimarangsee (1992, pp. 111, 126; pers. comm., Oct. 1993). FAS; A:T-28.

Wat Khao Noh; THAILAND; 15°57′N, 99°53′E; observed 10 Mar. 1967 by J. Fooden (1971, p. 17). Blood samples taken Aug.–Sep. 1988 by Y. Kawamoto, T. Ishida, J. Suzuki, O. Takenaka, and P. Varavudhi (1989, p. 95). Reported present 22 Feb. 1991 by N. Aggimarangsee (1992, pp. 112, 123; pers. comm., Oct. 1993). Subspecies uncertain; A:T-4.

Wat Khao Phlu. See Wat Tham Khao Phlu.

Wat Khao Sompoad (?= Som Phot); THAILAND; ca. 15°10′N, 101°17′E; observed 11 Jan. 1991

by N. Aggimarangsee (1992, pp. 111, 123). Subspecies uncertain; A:T-8.

Wat Khao Takhrao; THAILAND; 13°13′N, 99°56′E; observed 21 Aug. 1989 and 11 Feb. 1991 by N. Aggimarangsee (1992, pp. 110, 112, 132; pers. comm., Oct. 1993). Subspecies uncertain; A:T-37.

Wat Khao Takieb; THAILAND; 12°31′N, 99°59′E; observed 16–17 Sep. 1990 by N. Aggimarangsee (1992, pp. 110, 134; pers. comm., Oct. 1993). Subspecies uncertain; A:T-38.

Wat Khao Tamon; THAILAND; 13°07′N, 99°56′E; reported present 4 Feb. 1991 by N. Aggimarangsee (1992, pp. 112, 132; pers. comm., Oct. 1993). Subspecies uncertain; A:T-37.

Wat Khao Wong Kot; THAILAND; 15°01′N, 100°33′E; reported present 24 Jun. 1989 by unspecified informants (Aggimarangsee, 1992, pp. 109, 115, 124; pers. comm., Oct. 1993). Subspecies uncertain; A:T-6.

Wat Khao Yod Thong; THAILAND; 13°28′N, 99°43′E; reported present 25 Dec. 1990 by N. Aggimarangsee (1992, pp. 111, 127; pers. comm., Oct. 1993). FAS; A:T-28.

Wat Khuha Phimuk; THAILAND; ca. 6°31′N, 101°14′E; observed 21–22 Sep. 1990 by N. Aggimarangsee (1992, pp. 110, 139; pers. comm., Oct. 1993). FAS; A:T-69.

Wat Khuha Sawan; THAILAND; 7°37′N, 100°05′E; observed 20–21 Sep. 1990 and 26–28 Feb. 1991 by N. Aggimarangsee (1992, pp. 110, 112, 138; pers. comm., Oct. 1993). FAS; A:T-65.

Wat Koo Pra Kona; THAILAND; 15°33′N, 103°49′E; blood samples taken Aug.–Sep. 1988 by Y. Kawamoto, T. Ishida, J. Suzuki, O. Takenaka, and P. Varavudhi (1989, p. 95). Observed 14–16 Jul. 1989 and 17–18 Jan. 1991 by N. Aggimarangsee (1992, pp. 109, 112, 120; pers. comm., Oct. 1993). Subspecies uncertain; A:T-13.

Wat Krieng Krai Klang; THAILAND; 15°44′N, 100°11′E; observed 22 Feb. 1991 by N. Aggimarangsee (1992, pp. 112, 123; pers. comm., Oct. 1993). Subspecies uncertain; A:T-5.

Wat Kut; THAILAND; 13°09′N, 99°57′E; observed 19 Aug. 1989 by N. Aggimarangsee (1992, pp. 110, 131; pers. comm., Oct. 1993). Subspecies uncertain; A:T-37.

Wat Ngern Rung Sawang; THAILAND; 13°42′N, 99°46′E; observed 20 Dec. 1990 by N. Aggimarangsee (1992, pp. 111, 128; pers. comm., Oct. 1993). FAS; A:T-28.

Wat Noi Chompoo; THAILAND; 14°36′N, 100°09′E; reported present 7 Jul. 1989 by local monk (Aggimarangsee, 1992, pp. 109, 125; pers. comm., Oct. 1993). Subspecies uncertain; A:T-23.

Wat Phra Buddha Chai; THAILAND; 14°27′N, 100°57′E; observed 11 Jan. 1991 by N. Aggimarangsee (1992, pp. 111, 125; pers. comm., Oct. 1993). Subspecies uncertain; A:T-24.

Wat Ratch Singkhorn; THAILAND; 13°34′N, 99°47′E; blood samples taken Aug.–Sep. 1988 by Y. Kawamoto, T. Ishida, J. Suzuki, O. Takenaka, and P. Varavudhi (1989, p. 95). Observed 24 Dec. 1990 by N. Aggimarangsee (1992, pp. 111, 129; pers. comm., Oct. 1993). FAS; A:T-28.

Wat Suwankuha (cf. Wat Khuha Sawan); THAILAND; ca. 7°37′N, 100°05′E; blood samples taken Aug.–Sep. 1988 by Y. Kawamoto, T. Ishida, J. Suzuki, O. Takenaka, and P. Varavudhi (1989, p. 95). FAS; A:T-65.

Wat Tha Mai Lai; THAILAND; 10°30′N, 98°58′E; observed 18 Sep. 1990 by N. Aggimarangsee (1992, pp. 110, 137; pers. comm., Oct. 1993). AUR/FAS/MUL; A:T-43.

Wat Tham Khao Phlu; THAILAND; 10°44′N, 99°19′E; reported present 1–2 Dec. 1990 by local residents (Aggimarangsee, 1992, pp. 111, 137; pers. comm., Oct. 1993). AUR/FAS/MUL; A:T-42.

Wat Tham Kunchhorn; THAILAND; 13°29′N, 99°42′E; observed 19 Dec. 1990 by N. Aggimarangsee (1992, pp. 111, 126; pers. comm., Oct. 1993). FAS; A:T-28.

Wat Thammikaram Varaviharn; THAILAND; 11°49′N, 99°48′E; observed 17 Sep. 1990 by N. Aggimarangsee (1992, pp. 110, 134; pers. comm., Oct. 1993). AUR/FAS/MUL; A:T-41.

Wat Tham Sala; THAILAND; 13°49′N, 100°07′E; observed 12 May 1989 and 15–19 Dec. 1990 by N. Aggimarangsee (1992, pp. 109, 111, 125; pers. comm., Oct. 1993). FAS; A:T-29.

Wat Tham Sua; THAILAND; 8°07′N, 98°55′E; observed 19–20 Sep. 1990 by N. Aggimarangsee (1992, pp. 110, 138; pers. comm., Oct. 1993). FAS; A:T-60.

Wat Tham Suwan Khuha; THAILAND; 8°26′N, 98°28′E; observed 17–21 Nov. 1987 by R. Boonratana (1988, p. 75). Reported present 19 Sep. 1990 by local residents (Aggimarangsee, 1992, pp. 110, 137; pers. comm., Oct. 1993). Subspecies uncertain; A:T-51.

Waw, Telok. See Telok Wau.

Wawo. See Ntori, Sape district.

Way Kambas. See Kambas, Wai.

We, Pulau, INDONESIA; 5°47′–5°53′N, 95°13′–95°23′E; reported present before 1981 by J. T. Marshall (Crockett & Wilson, 1980, p. 156). Blood samples taken Nov.–Dec. 1986 by J. R. de Ruiter (1993, p. 91). Subspecies uncertain (see Scheffrahn et al., 1994, p. 136); B:IO-1.

Weh, Pulau. See *We, Pulau.*

Weld's Hill. See Nanas, Bukit, Kuala Lumpur.

West Bali National Park. See Bali Barat National Park.

West Bali Wildlife Reserve. See Bali Barat National Park.

Whykeong Union Council. See Bilasodia; Bimirdia; Ghorardia; Ochodia; Rukumodia.

Wimpong, limestone rocks; BURMA; ca. 16°53′N, 97°28′E; collected ca. 1877–1878 by W. Davison (see Hume & Davison, 1878, p. 524; Thomas, 1886, pp. 65, 66); BM(NH), 1. AUR; A:Bu-9.

Wong, Nam Mae, 40 mi (= 65 km) E of Um Pang, 1000 ft (= 300 m); THAILAND; ca. 15°55′N, 99°10′E; collected 9 Feb. 1924 by A. S. Vernay (see Lowe, 1932, p. 197; 1933, p. 260); AMNH, 1; BM(NH), 1. AUR; A:T-18.

Wong, Nam Mae, 53 mi (= 85 km) E of Um Pang, 800 ft (245 m); THAILAND; ca. 15°55′N, 99°25′E; collected 18 Feb. 1924 by A. S. Vernay (see Lowe, 1932, p. 197; 1933, p. 260); AMNH, 1. AUR; A:T-3.

Wonokerto. See Wonokojo (?= Wonokerto), Dampit district, southern Malang region.

Wonokojo (?= Wonokerto), Dampit district, southern Malang region; *Java,* INDONESIA; ca. 8°13′S, 112°35′E; collected Apr. 1930 by H. J. V. Sody; RMNH, 3. FAS; C:J-34.

Wonosobo, Propinsi Lampung; *Sumatra,* INDONESIA; 5°30′S, 104°30′E; collected 28 Dec. 1924 by H. J. V. Sody (see Hooijer, 1962b, p. 44); RMNH, 1(skull only). FAS; B:S-79.

Wynkoops Bay. See Pelabuhanratu, Teluk, Bantam region.

Xa Trang Bom; VIETNAM; 10°57′N, 107°01′E; collected 1 Jun. 1918 by C. B. Kloss (1919b, p. 401; cf. Weitzel et al., 1988, p. 146); ZRC, 1. FAS; A:V-3.

Yao Noi, Ko, THAILAND; 8°05′–8°11′N, 98°34′–98°38′E; collected 30 Jan. 1918 by local collectors employed by H. C. Robinson and C. B. Kloss (1919, p. 87); ZRC, 1. AUR/FAS/MUL; A:T-52.

Yaring, tidal creeks near; THAILAND; ca. 6°52′N, 101°22′E; observed Jun. 1901 by N. Annandale and H. C. Robinson (1903, p. xxxix; in Bonhote, 1903, p. 4). FAS; A:T-68.

Yaring region; THAILAND; ca. 6°52′N, 101°22′E; collected 19 Jun. 1899 by R. Evans and F. F. Laidlaw (see P. H. Napier, 1981, p. 17; cf. Bonhote, [1901], p. 870); University Museum of Zoology, Cambridge, 1 (skull only, not seen). FAS; A:T–68.

Ye Forest, Ataran district, Moulmein region; BURMA; ca. 16°10′N, 98°00′E; collected Nov. 1910 by G. F. B. R. Thurling (see Pocock, 1939, p. 81); BM(NH), 1. AUR; A:Bu-11.

Zadetkyi Kyun, BURMA; 9°50′–10°03′N, 98°07′–98°18′E; collected 9 Dec. 1900 by W. L. Abbott; USNM, 1. AUR; A:Bu-24.

Appendix 3: Dorsal Pelage Color Saturation in Fringing-Island Samples of *Macaca fascicularis* Compared with Saturation in Core-Area Reference Samples

Island[2]	Fringing-island samples: N	Frequencies at SI values: 0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	Mean	Core-area reference samples: Mean	N	FI > CA[3]	CA > FI[4]	P^5
Shallow-water islands															
West of Sumatra															
Tuangku	3		1	2						1.3	1.4	70		×	> 0.50
Mursala	2			2						1.5	1.4	70	×		> 0.50
Tanahbala	2		1	1						1.2	1.5	19		×	> 0.20
West of Isthmus of Kra and Malay Peninsula															
Kathema	4		2	1	1					1.4	1.1	22	×		> 0.20
Mibya	2			2						1.5	1.1	22	×		> 0.20
Kadan	1				1					2.0	1.1	22	×		> 0.10
Letsok-aw	1			1						1.5	1.1	36	×		> 0.40
Lanbi	1			1						1.5	1.1	36	×		> 0.40
Zadetkyi	1				1					2.0	1.1	20	×		0.20
Ru	1			1						1.5	1.1	20	×		> 0.20
Phayam	1		1							1.0	1.1	20		×	> 0.20
Na Ka Yai	1					1				2.5	1.1	20	×		0.10
Yao Noi	1				1					2.0	1.1	20	×		0.20
Rang Yai	1			1						1.5	1.0	18	×		> 0.20
Phi Phi Don	4		2	2						1.3	1.0	18	×		> 0.10
Talibong	2		2							1.0	1.0	18	—	—	> 0.20
Tarutao	6		1	5						1.4	1.0	18	×		< 0.02*
Butang	1			1						1.5	1.0	18	×		> 0.20
Langkawi	1			1						1.5	1.0	18	×		> 0.20
Burau	1			1						1.5	1.0	18	×		> 0.20
Pinang [1]	8		6	1	1					1.2	1.4	24		×	> 0.05
Pintu Gedong	3			1	2					1.8	1.4	15	×		> 0.10
East of Sumatra															
Bengkalis	1			1						1.5	1.5	18	—	—	> 0.20
Singapore	11		3	5	3					1.5	1.4	26	×		> 0.50
Karimun	7			6	1					1.6	1.4	26	×		> 0.20
Kundur	2			1	1					1.8	1.5	18	×		> 0.20
Durian	2			1	1					1.8	1.5	18	×		> 0.20
Sugi	1			1						1.5	1.4	26	×		> 0.50
Bulan	3			1	2					1.8	1.4	26	×		> 0.05
Batam	3			2	1					1.7	1.4	26	×		> 0.20
Galang	4		1	3						1.4	1.4	26	—	—	> 0.50
Nguwal	6		1	3	2					1.6	1.4	26	×		> 0.20
Bintan	8		1	2	4	1				1.8	1.4	26	×		< 0.05*
Mapur	1			1						1.5	1.4	26	×		> 0.50
Lingga	2			2						1.5	1.3	46	×		> 0.20
Bangka	3			2	1					1.7	1.2	28	×		< 0.05*
East of Isthmus of Kra and Malay Peninsula															
Phangan	2		2							1.0	1.0	18	—	—	> 0.20
Samui	2		1		1					1.5	1.0	18	×		> 0.20
Redang	2					2				2.5	1.3	15	×		0.02*
Pinang [2]	2			2						1.5	1.3	15	×		> 0.20
Tioman	11		2	7	2					1.5	1.4	26	×		> 0.50
Acheh	1			1						1.5	1.4	26	×		> 0.50
Pemanggil	2		1		1					1.5	1.4	26	×		> 0.50
Aur	3			1	2					1.8	1.4	26	×		> 0.05
Tinggi	5		2	3						1.3	1.4	26		×	> 0.40

Appendix 3: Continued

Island[2]	Fringing-island samples: N	Frequencies at SI values: 0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	Mean	Core-area reference samples: Mean	N	FI > CA[3]	CA > FI[4]	P^5
South of Indochinese Peninsula															
Khram Yai	10			4	6					1.8	1.1	27	×		< 0.001***
Chang	3		2		1					1.3	1.0	28	×		> 0.20
Kut	8	1	6	1						1.0	1.0	28	—	—	> 0.90
Phu Quoc	2		2							1.0	1.3	16		×	> 0.20
Con Son	8		1	5		2				1.7	1.3	15	×		> 0.20
Ba	3	1		1	1					1.3	1.3	15	—	—	> 0.20
West of Borneo															
Siantan	3			2	1					1.7	1.5	33	×		> 0.50
Laut	2		1	1						1.3	1.5	33		×	> 0.50
Natuna Besar	6		1	4		1				1.6	1.5	32	×		> 0.50
Lagong	1			1						1.5	1.5	32	—	—	> 0.90
Subi-kecil	3		1	2						1.3	1.5	32		×	> 0.50
Serasan	2			1		1				2.0	1.5	32	×		> 0.20
Uwi	1		1							1.0	1.5	33		×	> 0.20
Benua	2		1	1						1.3	1.5	33		×	> 0.50
Pejantan	1				1					2.0	1.5	33	×		> 0.20
Karimata	2			1		1				2.0	1.5	38	×		> 0.20
Serutu	1				1					2.0	1.5	38	×		> 0.20
Belitung	2				1	1				2.3	1.5	38	×		> 0.05
South of Borneo															
Karimunjawa	6					4	2			2.7	1.3	37	×		< 0.001***
Bawean	6		3	1	1	1				1.5	1.2	40	×		> 0.20
Matasiri	1			1						1.5	1.4	30	×		> 0.50
Kangean	1			1						1.5	1.2	40	×		> 0.40
Bali	19	3	7	3	5	1				1.3	1.2	40	×		> 0.50
Northeast of Borneo															
Banggi	5		1	1	1		2			2.1	1.3	20	×		0.05
Cagayan Sulu	1				1					2.0	1.2	49	×		> 0.10
Sebatik	3		2	1						1.2	1.3	45		×	> 0.50
Deep-water islands															
West of Sumatra															
Katchall	2						1		1	3.5	1.4	68	×		< 0.02*
Little Nicobar	3								3	4.0	1.4	68	×		< 0.01**
Great Nicobar	3								3	4.0	1.4	68	×		< 0.01**
Simeulue	13								13	4.0	1.4	68	×		< 0.001***
Lasia	2								2	4.0	1.4	68	×		< 0.02*
Nias[6]	12		2	7	1	2				1.6	1.4	69	×		> 0.10
Lesser Sunda Islands															
Penida	3			3						1.5	1.2	40	×		> 0.10
Lombok	2			2						1.5	1.2	40	×		> 0.20
Sumbawa	9		6	3						1.2	1.2	40	—	—	> 0.50
Flores	7	1	2	3	1					1.3	1.2	40	×		> 0.50
Sumba	8		2	6						1.4	1.2	40	×		> 0.20
Kambing	1		1							1.0	1.2	40		×	> 0.50
Timor	11		8	3						1.1	1.2	40		×	> 0.50
Philippines and Maratua															
Balabac	1						1			3.0	1.3	65	×		> 0.05
Palawan	12					3	9			2.9	1.3	65	×		< 0.001***
Culion	6					5	1			2.6	1.3	65	×		< 0.001***
Busuanga	1				1					2.0	1.3	65	×		> 0.10
Mindoro	7					2	5			2.9	1.3	65	×		< 0.001***

Appendix 3: Continued

Island[2]	Fringing-island samples N	Frequencies at SI values 0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	Mean	Core-area reference samples Mean	N	FI > CA[3]	CA > FI[4]	P[5]
Luzon	24					4	20			2.9	1.3	65	×		< 0.001***
Samar	3						3			3.0	1.3	65	×		< 0.01**
Leyte	5						5			3.0	1.3	65	×		< 0.001***
Negros	47			3	16	16	12			2.4	1.3	65	×		< 0.001***
Mindanao	65		32	8	12	9	4			1.6	1.3	65	×		< 0.02*
Balut	1						1			3.0	1.3	65	×		> 0.05
Basilan	3			2	1					1.7	1.3	65	×		> 0.10
Tawitawi	2		2							1.0	1.3	65		×	> 0.20
Maratua	4								4	4.0	1.3	42	×		< 0.01**

[1] Core-area reference samples, except those compared with Philippine samples, consist of specimens ($n \geq 15$) collected in 2-degree latitude–longitude blocks (Table 2) situated nearest to the respective fringing islands; all Philippine samples are compared with a core-area reference sample that consists of 65 specimens collected in northern Borneo, in three 2-degree blocks that border the Sulu Sea.

[2] For details, see Appendix 2 and Fooden (1991, p. 34).

[3] Fringing-island (FI) sample mean exceeds core-area (CA) reference sample mean.

[4] Core-area reference sample mean exceeds fringing-island sample mean.

[5] Mann-Whitney U-test, two-tailed; * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

[6] Cf. Scheffrahn et al. (1994, p. 136).

Appendix 4: Dorsal Pelage Color Erythrism in Fringing-Island Samples of *Macaca fascicularis* Compared with Erythrism in Core-Area Reference Samples

	Fringing-island samples							Core-area reference samples				
		Frequencies at erythrism index values										
Island[2]	N	1.0	1.5	2.0	2.5	3.0	Mean	Mean	N	FI > CA[3]	CA > FI[4]	P^5
Shallow-water islands												
West of Sumatra												
Tuangku	3		1	1	1		2.0	1.8	72	×		> 0.40
Mursala	2				2		2.5	1.8	72	×		< 0.05*
Tanahbala	2		1	1			1.8	2.1	19		×	> 0.20
West of Isthmus of Kra and Malay Peninsula												
Kathema	4	3		1			1.3	1.1	22	×		> 0.50
Mibya	2	2					1.0	1.1	22		×	> 0.50
Kadan	1				1		2.5	1.1	22	×		> 0.05
Letsok-aw	1		1				1.5	1.2	36	×		> 0.20
Lanbi	1			1			2.0	1.2	36	×		> 0.10
Zadetkyi	1			1			2.0	1.4	20	×		> 0.20
Ru	1			1			2.0	1.4	20	×		> 0.20
Phayam	1	1					1.0	1.4	20		×	> 0.20
Na Ka Yai	1			1			2.0	1.4	20	×		> 0.20
Yao Noi	1			1			2.0	1.4	20	×		> 0.20
Rang Yai	1		1				1.5	1.4	18	×		> 0.20
Phi Phi Don	4		4				1.5	1.4	18	×		> 0.20
Talibong	2		1	1			1.8	1.4	18	×		> 0.20
Tarutao	6		3	2	1		1.8	1.4	18	×		> 0.05
Butang	1			1			2.0	1.4	18	×		> 0.20
Langkawi	1		1				1.5	1.4	18	×		> 0.20
Burau	1				1		2.5	1.4	18	×		> 0.20
Pinang [1]	8		2	3	2	1	2.1	1.9	24	×		> 0.20
Pintu Gedong	3		2			1	2.0	2.0	15	—	—	> 0.20
East of Sumatra												
Bengkalis	1				1		2.5	2.1	18	×		> 0.20
Singapore	11	3	1	3	2	2	2.0	1.9	26	×		> 0.50
Karimun	7		1	2	3	1	2.3	1.9	26	×		> 0.10
Kundur	2			2			2.0	2.1	18		×	> 0.20
Durian	2				1	1	2.8	2.1	18	×		> 0.20
Sugi	1			1			2.0	1.9	26	×		> 0.50
Bulan	3		2			1	2.0	1.9	26	×		> 0.90
Batam	3		1	2			1.8	1.9	26		×	> 0.50
Galang	4	1	1	1	1		1.8	1.9	26		×	> 0.50
Nguwal	6			3	2	1	2.3	1.9	26	×		> 0.50
Bintan	8		1	5	1	1	2.1	1.9	26	×		> 0.20
Mapur	1				1		2.5	1.9	26	×		> 0.20
Lingga	2			2			2.0	1.8	46	×		> 0.20
Bangka	3	1		2			1.7	1.6	28	×		> 0.50
East of Isthmus of Kra and Malay Peninsula												
Phangan	2	2					1.0	1.4	18		×	> 0.20
Samui	2		1	1			1.8	1.4	18	×		> 0.20
Redang	2					2	3.0	1.6	15	×		0.05
Pinang [2]	2				2		2.5	1.6	15	×		> 0.05
Tioman	11	3	3	3	1	1	1.7	1.9	26		×	> 0.50
Acheh	1				1		2.5	1.9	26	×		> 0.20
Pemanggil	2	1	1				1.3	1.9	26		×	> 0.10
Aur	3	2			1		1.5	1.9	26		×	> 0.40
Tinggi	5		2	2	1		1.9	1.9	26	—	—	> 0.90
South of Indochinese Peninsula												
Khram Yai	10	9	1				1.1	1.1	27	—	—	> 0.50
Chang	3	1	2				1.3	1.1	28	×		> 0.05

Appendix 4: Continued

	Fringing-island samples							Core-area reference samples				
		Frequencies at erythrism index values										
Island[2]	N	1.0	1.5	2.0	2.5	3.0	Mean	Mean	N	FI > CA[3]	CA > FI[4]	P^5
Kut	8	5	1	2			1.3	1.1	28	×		> 0.10
Phu Quoc	2	1	1				1.3	1.4	16		×	> 0.20
Con Son	8	3	3	2			1.4	1.4	15	—	—	> 0.20
Ba	3	1		2			1.7	1.4	15	×		> 0.20
West of Borneo												
Siantan	3			2		1	2.3	1.5	32	×		< 0.05*
Laut	2		1	1			1.8	1.5	32	×		> 0.20
Natuna Besar	6	1		2	3		2.1	1.5	31	×		< 0.02*
Lagong	1				1		2.5	1.5	31	×		> 0.10
Subi-kecil	3	3					1.0	1.5	31		×	> 0.05
Serasan	2			1	1		2.3	1.5	31	×		> 0.05
Uwi	1				1		2.5	1.5	32	×		> 0.05
Benua	2		1		1		2.0	1.5	32	×		> 0.20
Pejantan	1		1				1.5	1.5	32	—	—	> 0.90
Karimata	2	1	1				1.3	1.5	38		×	> 0.40
Serutu	1	1					1.0	1.5	38		×	> 0.20
Belitung	2		2				1.5	1.5	38	—	—	> 0.50
South of Borneo												
Karimunjawa	6	6					1.0	1.2	37		×	> 0.05
Bawean	6	3	2	1			1.3	1.2	40	×		> 0.20
Matasiri	1		1				1.5	1.5	31	—	—	> 0.90
Kangean	1		1				1.5	1.2	40	×		> 0.20
Bali	19	14	2	3			1.1	1.2	40		×	> 0.20
Northeast of Borneo												
Banggi	5	3	2				1.2	1.1	20	×		> 0.20
Cagayan Sulu	1		1				1.5	1.1	49	×		> 0.20
Sebatik	3	1	2				1.3	1.2	43	×		> 0.20
Deep-water islands												
West of Sumatra												
Katchall	2	2					1.0	1.8	70		×	> 0.05
Little Nicobar	3	3					1.0	1.8	70		×	< 0.05*
Great Nicobar	3	3					1.0	1.8	70		×	< 0.05*
Simeulue	13	12	1				1.0	1.8	70		×	< 0.001***
Lasia	2	2					1.0	1.8	70		×	> 0.05
Nias	12		2	8	2		2.0	1.8	71	×		> 0.05
Lesser Sunda Islands												
Penida	3		1	2			1.8	1.2	40	×		< 0.02*
Lombok	2	2					1.0	1.2	40		×	> 0.20
Sumbawa	9	7	2				1.1	1.2	40		×	> 0.40
Flores	7	6	1				1.1	1.2	40		×	> 0.20
Sumba	8	5		3			1.4	1.2	40	×		> 0.40
Kambing	1		1				1.5	1.2	40	×		> 0.20
Timor	11	5	4	2			1.4	1.2	40	×		> 0.10
Philippines and Maratua												
Balabac	1			1			2.0	1.2	65	×		> 0.10
Palawan	9				5	4	2.7	1.2	65	×		< 0.001***
Culion	2				2		2.5	1.2	65	×		< 0.02*
Busuanga	1			1			2.0	1.2	65	×		> 0.10
Mindoro	3			1	2		2.3	1.2	65	×		< 0.01**
Luzon	10			5	5		2.3	1.2	65	×		< 0.001***
Samar	3		1	2			1.8	1.2	65	×		< 0.02*
Negros	45	1		32	12		2.1	1.2	65	×		< 0.001***

Appendix 4: Continued

Island[2]	Fringing-island samples: N	Frequencies at erythrism index values: 1.0	1.5	2.0	2.5	3.0	Mean	Core-area reference samples: Mean	N	FI > CA[3]	CA > FI[4]	P[5]
Mindanao	60	4	29	22	5		1.7	1.2	65	×		< 0.001***
Balut	1				1		2.5	1.2	65	×		> 0.05
Basilan	3	1	2				1.3	1.2	65	×		> 0.20
Maratua	4	4					1.0	1.2	42		×	> 0.20

[1] Core-area reference samples, except those compared with Philippine samples, consist of specimens ($n \geq 15$) collected in 2-degree latitude–longitude blocks (Table 4) situated nearest to the respective fringing islands; all Philippine samples are compared with a core-area reference sample that consists of 65 specimens collected in northern Borneo, in three 2-degree blocks that border the Sulu Sea.

[2] For details, see Appendix 2 and Fooden (1991, p. 34).

[3] Fringing-island (FI) sample mean exceeds core-area (CA) reference sample mean.

[4] Core-area reference sample mean exceeds fringing-island sample mean.

[5] Mann-Whitney U-test, two-tailed; * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Appendix 5: Crown Color Pattern Frequency in Samples of *Macaca fascicularis* That Include Dark-Crowned Specimens[1] (cf. Table 5)

Sample area	N	Crown color pattern		
		Crown colored like back, or brighter	Crown with diffuse blackish streak or wash	Crown with clearly defined blackish patch[2]
Core area				
Burma				
Taungbyauk	4	3	1	
Thagyet	5	3	2	
Ban Sadein	1		1	
Thailand				
Ban Tamrong Phato	7	6	1	
Lat Bua Khao	2	1	1	
Chumphon, Khlong	2		2	
Vietnam				
Sontra Peak	1		1	
Tay Ninh	1		1	
Xa Trang Bom	1		1	
Ho Chi Minh City	1		1	
"Cochin China"[3]	2	1		1
Indonesia: Kalimantan				
Pelaihari	1		1	
TOTAL	28	14	13	1
Shallow-water fringing islands				
Burma				
Lanbi	1		1	
Zadetkyi	1		1	
Thailand				
Khram Yai[4]	10		3	7
Kut	8	1	7	
Talibong	2	1	1	
Vietnam				
Phu Quoc	2		2	
Con Son[5]	9		1	8
Ba	3		2	1
Malaysia, West				
Aur	3	2	1	
Indonesia				
Pejantan	1		1	
Bangka	3	2	1	
Belitung	2		2	
Karimunjawa[6]	6	2	4	
Bali	19	18	1	
TOTAL	70	26	28	16
Deep-water fringing islands				
Philippines				
Mindanao	60	58	2	
Basilan	3	2		1
Island(s) unknown	5	3	2	
TOTAL	68	63	4	1

[1] Excludes infants.
[2] Cf. Figure 7.
[3] Cf. Elliot (1909, p. 252) and Kloss (1926, p. 358).
[4] Cf. Kloss (1919c, p. 347).
[5] Cf. Kloss (1921, p. 76; 1926, p. 358).
[6] Cf. Sody (1949, p. 132).

Appendix 6: Geographic Variation of Lateral Facial Crest Pattern in Samples of *Macaca fascicularis* (Including Infants) Collected or Observed in the Indochinese Peninsula, Isthmus of Kra, Malay Peninsula, Neighboring Shallow-Water Fringing Islands, Nicobar Islands, P. Simeulue, and P. Lasia (cf. Table 6; Figs. 8, 9)

A. Samples Homogeneous for Lateral Facial Crest Pattern

1. Indochinese Peninsula, Isthmus of Kra, Malay Peninsula
   a. Area homogeneous for the infrazygomatic pattern, n = 41. *BANGLADESH,* Whykeong (21°05′N, 90°12′E), 1 (cf. M. A. R. Khan, 1985, p. 29). *BURMA,* Arakan Div. (19°27′N, 93°31′E), 1; Wimpong (16°53′N, 97°28′E), 1; Haungtharaw (16°30′N, 98°13′E), 4; Ye Forest (16°10′N, 98°00′E), 1; Tavoy River (14°02′N, 98°12′E), 2; Taungbyauk (13°45′N, 98°26′E), 4; Mergui (12°26′N, 98°36′E), 2; Tagoot (12°15′N, 99°03′E), 2; Tenasserim (12°05′N, 99°01′E), 11; Ban Sadein (10°20′N, 98°32′E), 1. *THAILAND,* Wong, Nam Mae, 65 km E of Um Pang (15°55′N, 99°10′E), 2; Wong, Nam Mae, 85 km E of Um Pang (15°55′N, 99°25′E), 1; Ban Tamrong Phato (14°54′N, 98°31′E), 7; *COUNTRY UNCERTAIN,* "Bengale" (coordinates unknown), 1.
   b. Area homogeneous for the transzygomatic pattern, n = 66 (excludes 2 specimens with transzygomatic crests that were collected at unspecified localities in Thailand). *THAILAND,* Pak Nam Pho (15°43′N, 100°12′E), 3; Kata Taek (15°28′N, 99°23′E), 6; Lat Bua Khao (14°52′N, 101°36′E), 2; Ban Phu Toie (14°42′N, 99°07′E), 2; Ban Huai Maenam Noi (14°25′N, 98°51′E), 2; Aranyaprathet (13°41′N, 102°30′E), 1; Laem Sing Mountains (12°29′N, 102°06′E), 1; Ban Thap Plik (8°11′N, 98°53′E), 2; Tham Hom (8°11′N, 98°53′E), 1; Ban Nong Kok (8°06′N, 98°52′E), 1; Tyching (7°33′N, 99°35′E), 2; Kantang (7°25′N, 99°30′E), 1; Khao Rang Kai (7°19′N, 99°48′E), 1; Ban Phra Muang (7°21′N, 99°28′E), 2; Ban Sai Kau (6°38′N, 101°08′E), 1; Kampong Biserat (6°32′N, 101°14′E), 3. *VIETNAM,* Sontra Peak (16°07′N, 108°21′E), 1; Tay Ninh (11°18′N, 106°06′E), 1; Xa Trang Bom (10°57′N, 107°00′E), 1; Ho Chi Minh City (10°45′N, 106°42′E), 2; Cochin China (coordinates uncertain), 1. *VIETNAM OR CAMBODIA,* no locality, 2. *WEST MALAYSIA,* 16 localities, 27.
2. Neighboring shallow-water fringing islands
   a. Island group homogeneous for the infrazygomatic pattern, n = 10. *BURMA,* Mergui Archipelago, Kathema (13°39′N, 98°12′E), 4; Mibya (13°36′N, 98°12′E), 2; Kadan (12°30′N, 98°22′E), 1; Letsokaw (11°37′N, 98°15′E), 1; Lanbi (10°50′N, 98°15′E), 1; Zadetkyi (9°58′N, 98°13′E), 1.
   b. Islands homogeneous for the transzygomatic pattern, n = 102. *THAILAND,* Khram Yai (12°42′N, 100°47′E), 11; Chang (12°00′N, 102°23′E), 3; Kut (11°40′N, 102°35′E), 8; Phangan (9°45′N, 100°00′E), 2; Samui (9°30′N, 100°00′E), 2; Phi Phi Don (7°45′N, 98°47′E), 4; Talibong (7°15′N, 99°29′E), 2; Tarutao (6°35′N, 99°40′E), 6; Butang (6°32′N, 99°12′E), 1. *VIETNAM,* Phu Quoc (10°13′N, 103°57′E), 1; Con Son (8°43′N, 106°35′E), 9; Ba (8°39′N, 106°33′E), 3. *WEST MALAYSIA,* 11 islands, 39. *SINGAPORE* (1°23′N, 103°50′E), 11.

B. Samples Heterogeneous for Lateral Facial Crest Pattern

Sample area	Latitude (N)	Longitude (E)	N	Frequencies of lateral facial crest patterns: Infra-zygomatic	Trans-zygomatic	Asymmetric
1. Indochinese Peninsula, Isthmus of Kra						
Thailand						
Phu Phan	16°42′	104°24′	1	1		
Ban Mae Na Ree	16°25′	99°23	3	1	2	
Ban Nam Lai Tai	16°10′	99°20	6	2	3	1
Pak Chong	14°42′	101°28′	2		1	1
Pran Buri	12°24′	100°00′	2		1	1
Chumphon	10°22′	99°10′	2		2	
Nakhon Si Thammarat	8°26′	99°58′	4		4	
Ban Na	8°10′	100°12′	1	1		
Laos						
Thateng	15°26′	106°24′	5	4	1	
Vietnam						
Lac Giao	12°40′	108°00′	1	1		
Burma						
Thagyet	12°06′	99°07′	7	5	1	1
Pakchan River, Maliwun	10°14′	98°37′	1		1	
Pakchan River, Bankachon	10°09′	98°36′	2	2		
Total			37	17	16	4
2. Neighboring shallow-water fringing islands						
Thailand						
Ru	9°57′	98°32′	1		1	
Phayam	9°44′	98°25′	1			1
Na Ka Yai	8°12′	98°31′	1			1
Yao Noi	8°07′	98°37′	1		1	
Rang Yai	7°57′	98°26′	1			1
TOTAL			5		2	3
3. Deep-water fringing islands: Nicobar Islands, P. Simeulue, P. Lasia						
India: Nicobar Islands						
Katchall	8°00′	93°22′	2		2	
Little Nicobar	7°19′	93°41′	3	2	1	
Great Nicobar	6°59′	93°46′	3	1	2	
TOTAL			8	3	5	
Indonesia: west of Sumatra						
Simeulue	2°39′	96°08′	13	9	4	
Lasia	2°10′	96°38′	2	1	1	
TOTAL			15	10	5	

Appendix 7: Head and Body Length (mm) in Fringing-Island Samples of *Macaca fascicularis* Compared with Head and Body Length in Core-Area Reference Samples Collected at Similar Latitudes[1] (cf. Table 9; Figs. 11, 12)

Island[2]	Fringing-island samples: Latitude[3] (°N)	Sample statistics: N	Mean ± SD[4]	Extremes	Core-area sample statistics: N	Mean ± SD	FI > CA[5]	CA > FI[6]	P[7]
A. Adult females									
Shallow-water islands									
West of Sumatra									
Mursala	1.67	1	390		18	407.3 ± 35.19		×	> 0.20
West of Isthmus of Kra and Malay Peninsula									
Zadetkyi	9.97	1	470		18	432.5 ± 52.83	×		> 0.20
Na Ka Yai	8.20	1	418		12	405.4 ± 34.97	×		> 0.20
Rang Yai	7.95	1	375		11	403.2 ± 35.76		×	> 0.20
Phi Phi Don	7.75	2	420.5	415–426	10	394.0 ± 19.77	×		> 0.10
Tarutao	6.58	2	414.5	379–450	19	393.4 ± 14.38	×		> 0.20
Pinang [1]	5.47	1	340		15	399.1 ± 20.66		×	0.20
East of Sumatra									
Singapore	1.42	1	381		16	411.4 ± 35.26		×	> 0.20
Karimun	1.06	2	335.0	315–355	17	411.9 ± 34.21		×	< 0.05*
Kundur	0.88	1	348		17	411.9 ± 34.21		×	0.20
Bulan	0.96	1	339		17	411.9 ± 34.21		×	0.20
Batam	1.12	2	382.0	379–385	17	411.9 ± 34.21		×	> 0.20
Nguwal	0.65	1	375		18	416.8 ± 35.36		×	> 0.20
Bintan	1.15	2	353.5	320–387	17	411.9 ± 34.21		×	> 0.10
East of Isthmus of Kra and Malay Peninsula									
Phangan	9.75	2	395.5	391–400	18	432.5 ± 52.83		×	> 0.20
Pinang [2]	5.73	1	395		19	396.3 ± 19.38		×	> 0.20
Tioman	2.80	6	399.3 ± 26.71	365–435	16	410.9 ± 36.29		×	> 0.20
South of Indochinese Peninsula									
Khram Yai[8]	12.70	4	418.8 ± 11.09	410–435	15	452.3 ± 50.22		×	> 0.20
Kut	11.67	2	401.0	392–410	17	448.4 ± 48.54		×	0.20
Con Son	8.72	1	380		12	405.4 ± 34.97		×	> 0.20
West of Borneo									
Subi-kecil	3.03	1	393		19	406.1 ± 35.57		×	> 0.20
Uwi	1.10	1	394		17	411.9 ± 34.21		×	> 0.20
South of Borneo									
Karimunjawa	−5.85	2	443.5	417–470	12	434.5 ± 32.08	×		> 0.20
Bawean	−5.80	2	418.0	398–438	12	434.5 ± 32.08		×	> 0.20
Bali[9]	−8.25	4	430.8 ± 7.80	422–441	11	435.1 ± 33.30		×	> 0.10
Northeast of Borneo									
Banggi	7.15	1	413		10	394.0 ± 19.77	×		> 0.20
Deep-water islands									
West of Sumatra									
Simeulue[10]	2.66	4	398.8 ± 50.72	325–440	16	410.9 ± 36.29		×	> 0.20
Nias	1.22	3	372.0 ± 19.16	350–385	16	411.4 ± 35.26		×	> 0.05
Lesser Sunda Islands									
Sumbawa[9]	−8.56	2	415.0	390–440	11	435.1 ± 33.30		×	> 0.20
Flores[9]	−8.59	2	385.0	360–410	11	435.1 ± 33.30		×	> 0.10
Sumba[9]	−9.70	2	428.0	406–450	11	435.1 ± 33.30		×	> 0.20
Timor[9]	−9.57	1	490		11	435.1 ± 33.30	×		0.20

Appendix 7: Continued

Island[2]	Latitude[3] (°N)	Fringing-island samples: Sample statistics N	Mean ± SD[4]	Extremes	Core-area sample statistics N	Mean ± SD	FI > CA[5]	CA > FI[6]	P[7]
Philippines and Maratua									
Palawan	9.67	1	420		18	432.5 ± 52.83		×	> 0.20
Busuanga	12.07	1	420		18	445.7 ± 48.46		×	> 0.20
Luzon[11]	16.44	1	420		14	447.1 ± 52.16		×	> 0.20
Negros	9.42	5	425.8 ± 23.88	400–462	18	432.5 ± 52.82		×	> 0.20
Mindanao	7.12	5	438.6 ± 17.24	420–465	10	394.0 ± 19.77	×		< 0.01**
Tawitawi	5.17	1	394		16	398.5 ± 20.04		×	> 0.20
Maratua	2.25	1	420		16	410.9 ± 36.29	×		> 0.20
B. Adult males									
Shallow-water islands									
West of Sumatra									
Tuangku	2.22	2	424.0	423–425	20	456.1 ± 44.97		×	> 0.20
Mursala	1.67	2	442.5	440–445	18	453.7 ± 44.74		×	> 0.20
Tanahmasa	−0.18	1	435		15	482.9 ± 49.87		×	> 0.20
Tanahbala	−0.43	1	415		20	484.8 ± 43.38		×	0.20
West of Isthmus of Kra and Malay Peninsula									
Kadan[12]	12.50	1	520		9	477.6 ± 73.41	×		> 0.20
Yao Noi	8.12	1	440		19	457.1 ± 29.93		×	> 0.20
Phi Phi Don	7.75	1	450		19	457.1 ± 29.93		×	> 0.20
Talibong	7.25	2	476.0	470–482	19	457.1 ± 29.93	×		> 0.20
Tarutao	6.58	4	458.8 ± 16.52	440–480	19	457.1 ± 29.93	×		> 0.20
Butang	6.53	1	403		19	457.1 ± 29.93		×	0.10
Langkawi	6.37	1	430		19	457.1 ± 29.93		×	> 0.20
Burau	6.35	1	440		19	457.1 ± 29.93		×	> 0.20
Pinang [1]	5.47	5	403.4 ± 18.13	374–423	18	454.3 ± 28.06		×	0.002**
Pintu Gedong	2.92	2	408.0	405–411	16	439.9 ± 40.62		×	> 0.20
East of Sumatra									
Bengkalis	1.45	1	445		16	450.1 ± 45.21		×	> 0.20
Padang	1.37	1	412		16	450.1 ± 45.21		×	> 0.20
Singapore	1.42	2	451.0	432–470	16	450.1 ± 45.21	×		> 0.20
Karimun	1.06	4	426.2 ± 34.37	392–474	20	449.4 ± 41.78		×	> 0.20
Kundur	0.88	1	483		19	450.3 ± 42.69	×		> 0.20
Durian	0.73	1	430		15	472.0 ± 44.10		×	> 0.20
Sugi	0.82	1	420		16	459.6 ± 38.48		×	> 0.20
Bulan	0.96	1	472		20	449.4 ± 41.78	×		> 0.20
Galang	0.75	1	425		17	466.1 ± 45.88		×	> 0.20
Bintan	1.15	4	449.0 ± 30.99	410–485	14	453.8 ± 47.23		×	> 0.20
Mapur	1.00	1	395		19	450.3 ± 42.69		×	> 0.20
Bangka	−2.03	3	420.0 ± 32.23	383–442	17	488.1 ± 46.40		×	0.02*
East of Isthmus of Kra and Malay Peninsula									
Samui	9.50	2	430.0	423–437	20	465.8 ± 48.41		×	> 0.20
Pinang [2]	5.73	1	443		18	454.3 ± 28.06		×	> 0.20
Tioman	2.80	3	452.3 ± 18.45	432–468	19	444.4 ± 39.73	×		> 0.20
Acheh	2.67	1	498		20	445.7 ± 39.09	×		> 0.20
Pemanggil	2.58	1	415		20	445.7 ± 39.09		×	> 0.20
Aur	2.45	1	427		18	444.2 ± 40.68		×	> 0.20
Tinggi	2.30	1	538		17	446.2 ± 40.99	×		0.20
South of Indochinese Peninsula									
Khram Yai[12]	12.70	5	452.0 ± 17.18	425–465	9	477.6 ± 72.28		×	> 0.20
Kut[12]	11.67	3	441.3 ± 19.50	419–455	9	477.6 ± 72.28		×	> 0.20
Phu Quoc[12]	10.22	1	435		9	477.6 ± 72.28		×	> 0.20
Con Son	8.72	3	454.0 ± 23.30	435–480	19	457.1 ± 29.93		×	> 0.20
Ba	8.65	2	443.5	440–447	19	457.1 ± 29.93		×	> 0.20

Appendix 7: Continued

Island[2]	Fringing-island samples: Latitude[3] (°N)	Sample statistics: N	Mean ± SD[4]	Extremes	Core-area sample statistics: N	Mean ± SD	FI > CA[5]	CA > FI[6]	P[7]
West of Borneo									
Siantan	3.13	2	450.0	440–460	18	440.5 ± 38.25	×		> 0.20
Laut	4.72	1	457		19	453.7 ± 23.98	×		> 0.20
Natuna Besar	3.78	1	445		18	440.5 ± 38.25	×		> 0.20
Lagong	3.60	1	419		18	440.5 ± 38.25		×	> 0.20
Subi-kecil	3.03	1	453		20	441.7 ± 36.36	×		> 0.20
Benua	0.95	1	432		16	459.6 ± 38.48		×	> 0.20
Karimata	−1.60	2	460.0	460–460	17	488.1 ± 46.40		×	> 0.20
Serutu	−1.72	1	464		17	488.1 ± 46.40		×	> 0.20
Belitung	−2.93	2	467.5	450–485	17	510.5 ± 35.46		×	> 0.10
South of Borneo									
Karimunjawa	−5.85	1	501		15	495.3 ± 46.66	×		> 0.20
Bawean	−5.80	1	472		15	495.3 ± 46.66		×	> 0.20
Matasiri	−4.78	1	435		20	501.4 ± 41.32		×	> 0.20
Bali[9]	−8.25	6	464.7 ± 29.19	425–495	19	512.7 ± 46.28		×	< 0.05*
Northeast of Borneo									
Banggi	7.15	2	505.0	485–525	19	457.1 ± 29.93	×		> 0.05
Deep-water islands									
West of Sumatra									
Katchall	8.00	1	525		19	457.1 ± 29.93			
Little Nicobar	7.32	2	490.0	475–505	19	457.1 ± 29.93	×		> 0.20
Simeulue	2.66	6	478.3 ± 14.38	460–495	20	445.7 ± 39.09	×		< 0.05*
Lasia	2.17	1	470		20	456.1 ± 44.97	×		> 0.20
Nias	1.22	7	455.1 ± 21.45	430–490	17	450.4 ± 43.79	×		> 0.20
Lesser Sunda Islands									
Penida[9]	−8.75	1	458		19	512.7 ± 46.28		×	> 0.20
Lombok[9]	−8.48	2	450.0	430–470	19	512.7 ± 46.28		×	> 0.05
Sumbawa[9]	−8.56	3	480.0 ± 10.00	470–490	19	512.7 ± 46.28		×	> 0.10
Flores[9]	−8.59	1	423		19	512.7 ± 46.28		×	0.10
Sumba[9]	−9.70	1	452		19	512.7 ± 46.28		×	> 0.20
Philippines and Maratua									
Balabac	7.90	1	450		19	457.1 ± 29.93		×	> 0.20
Palawan	9.67	4	470.5 ± 49.10	410–530	20	465.8 ± 48.41	×		> 0.20
Culion[12]	11.85	2	479.5	463–496	9	477.6 ± 72.28	×		> 0.20
Mindoro[12]	13.17	3	482.0 ± 35.38	450–520	9	477.6 ± 72.28	×		> 0.20
Luzon[12]	16.44	3	501.7 ± 2.89	500–505	9	477.6 ± 72.28	×		> 0.20
Negros	9.42	2	502.5	466–539	20	465.8 ± 48.41	×		> 0.20
Mindanao	7.12	5	486.6 ± 24.45	445–508	19	457.1 ± 29.93	×		> 0.05
Tawitawi	5.17	1	386		20	453.4 ± 26.74		×	0.10
Maratua	2.25	1	440		17	446.2 ± 40.99		×	> 0.20

[1] Mean latitude of core-area reference sample equals mean latitude of respective fringing-island sample; preferred size of core-area reference sample is 10–20.

[2] For details, see Appendix 2 and Fooden (1991, p. 34).

[3] Mean latitude of fringing-island sample localities (cf. Figs. 11, 12); negative numbers indicate latitudes south of the equator.

[4] Standard deviation specified where n > 2.

[5] Fringing-island (FI) sample mean exceeds core-area (CA) reference sample mean.

[6] Core-area reference sample mean exceeds fringing-island sample mean.

[7] Mann-Whitney *U*-test, two-tailed; * $P < 0.05$, ** $P < 0.01$.

[8] For measurement of ZRC 4-012, cf. Kloss (1919c, p. 349) and Wetizel et al. (1988, p. 105).

[9] Core-area reference samples consist of all measured female or male specimens collected in Java.

[10] Excludes aberrantly large female (RMNH Coll. No. 1161, HB = 505) included in Figure 27.

[11] Core-area reference sample consists of all measured female specimens collected north of 12.00°N.

[12] Core-area reference samples consist of all measured male specimens collected north of 5.70°N.

Appendix 8: Tail Length (mm) in Fringing-Island Samples of *Macaca fascicularis* Compared with Tail Length in Core-Area Reference Samples Collected at Similar Latitudes[1] (cf. Table 11; Figs. 15, 16)

Island[2]	Fringing-islands samples: Latitude[3] (°N)	Sample statistics: N	Mean ± SD[4]	Extremes	Core-area sample statistics: N	Mean ± SD	FI > CA[5]	CA > FI[6]	P[7]
A. Adult females									
Shallow-water islands									
West of Sumatra									
Mursala	1.67	1	545		18	513.2 ± 62.30	×		> 0.20
West of Isthmus of Kra and Malay Peninsula									
Zadetkyi	9.97	1	420		18	489.6 ± 35.59		×	0.20
Na Ka Yai	8.20	1	430		12	495.3 ± 34.50		×	0.20
Rang Yai	7.95	1	420		11	495.8 ± 36.14		×	0.20
Phi Phi Don	7.75	2	540.0	528–552	10	501.9 ± 31.61	×		0.20
Tarutao	6.58	2	508.5	505–512	19	496.0 ± 28.38	×		> 0.20
Pinang [1]	5.47	1	464		15	495.3 ± 29.79		×	> 0.20
East of Sumatra									
Singapore	1.42	1	445		16	516.4 ± 65.06		×	> 0.20
Karimun	1.06	2	423.5	412–435	17	517.5 ± 63.15		×	0.05
Kundur	0.88	1	475		17	517.5 ± 63.15		×	> 0.20
Bulan	0.96	1	503		17	517.5 ± 63.15		×	> 0.20
Batam	1.12	2	470.5	456–485	17	517.5 ± 63.15		×	0.10
Nguwal	0.65	1	505		18	527.5 ± 36.84		×	> 0.20
Bintan	1.15	3	451.0 ± 8.57	420–503	17	517.5 ± 63.15		×	0.05
East of Isthmus of Kra and Malay Peninsula									
Phangan	9.75	2	426.5	411–442	18	489.6 ± 35.59		×	0.05
Pinang [2]	5.73	1	550		19	496.8 ± 31.12	×		0.20
Tioman[1]	2.80	5	418.2 ± 23.29	395–450	16	512.2 ± 66.43		×	0.002**
South of Indochinese Peninsula									
Khram Yai	12.70	4	473.8 ± 6.29	465–480	15	436.7 ± 57.74	×		> 0.20
Kut	11.67	2	442.0	432–452	17	446.2 ± 60.83		×	> 0.20
Con Son	8.72	1	470		12	495.3 ± 34.50		×	> 0.20
West of Borneo									
Subi-kecil	3.03	1	465		19	509.6 ± 62.09		×	> 0.20
Uwi	1.10	1	514		17	517.5 ± 63.15		×	> 0.20
South of Borneo									
Karimunjawa	−5.85	2	471.0	467–475	12	475.7 ± 52.68		×	> 0.20
Bawean	−5.80	3	526.7 ± 48.05	475–570	12	475.7 ± 52.68	×		0.20
Bali[8]	−8.25	4	441.5 ± 46.77	375–480	11	468.6 ± 52.37		×	> 0.20
Northeast of Borneo									
Banggi	7.15	1	492		10	501.9 ± 31.61		×	> 0.20
Deep-water islands									
West of Sumatra									
Simeulue[9]	2.65	4	412.5 ± 53.31	345–475	16	512.2 ± 66.43		×	< 0.02*
Nias	1.22	3	427.0 ± 21.28	400–450	16	516.4 ± 65.06		×	0.02*
Lesser Sunda Islands									
Sumbawa[8]	−8.56	2	430	400–460	11	468.6 ± 52.37		×	> 0.20
Flores[8]	−8.59	2	417.5	390–445	11	468.6 ± 52.37		×	0.20
Sumba[8]	−9.70	2	406.0	404–408	11	468.6 ± 52.37		×	> 0.10
Timor[8]	−9.57	1	345		11	468.6 ± 52.37		×	> 0.20

Appendix 8: Continued

Island[2]	Latitude[3] (°N)	Fringing-islands samples: Sample statistics N	Mean ± SD[4]	Extremes	Core-area sample statistics N	Mean ± SD	FI > CA[5]	CA > FI[6]	P[7]
Philippines and Maratua									
Busuanga	12.07	1	530		18	443.6 ± 60.01	×		> 0.20
Luzon[10]	16.44	2	547.5	515–580	14	430.4 ± 58.58	×		0.05
Negros	9.42	5	491.8 ± 41.62	455–538	18	489.6 ± 35.59	×		> 0.20
Mindanao	7.12	5	510.8 ± 56.31	445–564	10	501.9 ± 31.61	×		> 0.20
Tawitawi	5.17	1	504		16	496.4 ± 29.12	×		> 0.20
Maratua	2.25	1	530		16	512.2 ± 66.43	×		> 0.20
B. Adult males									
Shallow-water islands									
West of Sumatra									
Tuangku	2.22	2	505.0	480–530	19	572.5 ± 36.65		×	> 0.05
Mursala	1.67	1	500		18	573.2 ± 37.59		×	0.20
Tanahmasa	−0.18	1	570		15	589.9 ± 48.71		×	> 0.20
Tanahbala	−0.43	1	550		20	585.6 ± 44.51		×	> 0.20
West of Isthmus of Kra and Malay Peninsula									
Kadan[11]	12.50	1	495		9	550.7 ± 59.48		×	> 0.20
Yao Noi	8.12	1	530		20	563.8 ± 48.52		×	> 0.20
Phi Phi Don	7.75	1	570		20	563.8 ± 48.52	×		> 0.20
Talibong	7.25	2	557.5	556–559	20	563.8 ± 48.52		×	> 0.20
Tarutao	6.58	4	566.3 ± 16.01	550–580	20	563.8 ± 48.52	×		> 0.20
Langkawi	6.37	1	570		20	563.8 ± 48.52	×		> 0.20
Burau	6.35	1	525		20	563.8 ± 48.52		×	> 0.20
Pinang [1]	5.47	5	519.4 ± 17.57	491–539	19	560.1 ± 46.78		×	0.05
Pintu Gedong	2.92	2	505.0	495–515	15	570.7 ± 38.82		×	< 0.05*
East of Sumatra									
Bengkalis	1.45	1	495		16	576.3 ± 37.44		×	0.20
Padang	1.37	1	470		16	576.3 ± 37.44		×	0.20
Singapore	1.42	2	565.0	533–597	16	576.3 ± 37.44		×	> 0.20
Karimun	1.06	4	506.5 ± 45.18	472–572	20	580.3 ± 45.16		×	0.02*
Durian	0.73	1	590		15	586.2 ± 51.04	×		> 0.20
Sugi	0.82	1	522		16	575.7 ± 46.85		×	> 0.20
Bulan	0.96	1	530		20	580.3 ± 45.16		×	> 0.20
Galang	0.75	1	580		17	581.2 ± 50.80		×	> 0.20
Bintan	1.15	4	500.8 ± 19.47	485–525	14	574.3 ± 37.64		×	< 0.01**
Mapur	1.00	1	535		19	578.0 ± 45.23		×	> 0.20
Bangka	−2.03	3	480.7 ± 42.85	435–520	17	586.2 ± 45.27		×	< 0.01**
East of Isthmus of Kra and Malay Peninsula									
Samui	9.50	2	480.5	459–502	21	562.4 ± 47.71		×	< 0.05*
Pinang [2]	5.73	1	620		19	560.1 ± 46.78	×		0.20
Tioman	2.80	3	483.7 ± 14.01	470–498	18	568.2 ± 37.25		×	0.002**
Acheh	2.67	1	698		19	567.5 ± 36.33	×		0.10
Pemanggil	2.58	1	544		19	567.5 ± 36.33		×	> 0.20
Aur	2.45	1	575		17	565.3 ± 32.74	×		> 0.20
South of Indochinese Peninsula									
Khram Yai[11]	12.70	5	532.0 ± 18.24	510–550	9	550.7 ± 59.48		×	> 0.20
Kut[11]	11.67	3	484.3 ± 1.15	483–485	9	550.7 ± 59.48		×	> 0.20
Phu Quoc[11]	10.22	1	445		9	550.7 ± 59.48		×	0.20
Con Son	8.72	3	509.0 ± 27.22	489–540	20	563.8 ± 48.52		×	< 0.10
Ba	8.65	2	530.0	500–560	20	563.8 ± 48.52		×	> 0.20
West of Borneo									
Siantan	3.13	2	542.5	520–565	17	575.6 ± 39.07		×	> 0.20
Laut	4.72	1	533		20	567.9 ± 45.66		×	> 0.20

Appendix 8: Continued

Island[2]	Fringing-island samples: Latitude[3] (°N)	Sample statistics: N	Mean ± SD[4]	Extremes	Core-area sample statistics: N	Mean ± SD	FI > CA[5]	CA > FI[6]	P[7]
Natuna Besar	3.78	1	480		17	575.6 ± 39.07		×	0.20
Lagong	3.60	1	559		17	575.6 ± 39.07		×	> 0.20
Subi-kecil	3.03	1	500		19	572.4 ± 38.98		×	0.10
Benua	0.95	1	559		16	575.7 ± 46.85		×	> 0.20
Karimata	−1.60	2	642.5	630–655	17	586.2 ± 45.27	×		> 0.10
Serutu	−1.72	1	591		17	586.2 ± 45.27	×		> 0.20
Belitung	−2.93	2	462.5	445–480	17	577.0 ± 35.28		×	0.02*
South of Borneo									
Karimunjawa	−5.85	1	544		14	570.5 ± 74.78		×	>0.20
Bawean	−5.80	2	580.0	580–580	14	570.5 ± 74.78	×		> 0.20
Matasiri	−4.78	1	540		19	555.6 ± 47.15		×	> 0.20
Bali[8]	−8.25	6	517.8 ± 23.49	485–546	18	556.5 ± 84.86		×	> 0.10
Northeast of Borneo									
Banggi	7.15	2	607.5	595–620	20	563.8 ± 48.52	×		> 0.20
Deep-water islands									
West of Sumatra									
Katchall	8.00	1	605		20	563.8 ± 48.52	×		> 0.20
Little Nicobar	7.32	2	565.0	550–580	20	563.8 ± 48.52	×		> 0.20
Simeulue	2.66	6	465.8 ± 25.18	435–490	19	567.5 ± 36.33		×	< 0.002**
Lasia	2.17	1	555		19	572.5 ± 36.65		×	> 0.20
Nias	1.22	7	505.3 ± 28.99	475–560	17	575.6 ± 36.35		×	< 0.002**
Lesser Sunda Islands									
Penida[8]	−8.75	1	462		18	556.5 ± 84.86		×	> 0.20
Lombok[8]	−8.48	2	447.5	445–450	18	556.5 ± 84.86		×	0.05
Sumbawa[8]	−8.56	3	506.7 ± 35.12	470–540	18	556.5 ± 84.86		×	> 0.20
Flores[8]	−8.59	1	500		18	556.5 ± 84.86		×	> 0.20
Sumba[8]	−9.70	1	503		18	556.5 ± 84.86		×	> 0.20
Philippines and Maratua									
Balabac	7.90	2	527.0	510–544	20	563.8 ± 48.52		×	> 0.20
Palawan	9.67	4	526.8 ± 34.19	487–560	21	562.4 ± 47.71		×	> 0.10
Culion[11]	11.85	3	526.7 ± 27.23	496–548	9	550.7 ± 59.48		×	> 0.20
Mindoro[11]	13.17	3	570.7 ± 16.17	552–580	9	550.7 ± 59.48	×		> 0.20
Luzon[11]	16.44	6	561.2 ± 41.81	510–625	9	550.7 ± 59.48	×		> 0.20
Leyte	11.08	2	540.0	490–590	9	550.7 ± 59.48		×	> 0.20
Negros	9.42	3	572.3 ± 7.37	564–578	21	562.4 ± 47.71	×		> 0.50
Mindanao	7.12	5	552.4 ± 38.25	510–600	20	563.8 ± 48.52		×	> 0.20
Tawitawi	5.17	1	507		20	562.2 ± 46.59		×	> 0.20
Maratua	2.25	1	575		16	565.6 ± 33.79	×		> 0.20

[1] Mean latitude of core-area reference sample equals mean latitude of respective fringing-island sample; preferred size of core-area reference sample is 10–20. Excluded from this table are bobtailed specimens ZRC 4-127 (female, West Malaysia: P. Tioman, Telok Juara, T = 215 mm) and BM(NH) 1955.1511 (male, Thailand: Ko Butang, T = 269 mm).

[2] For details, see Appendix 2 and Fooden (1991, p. 34).

[3] Mean latitude of fringing-island sample localities (cf. Figs. 15, 16); negative numbers indicate latitudes south of the equator.

[4] Standard deviation specified where n > 2.

[5] Fringing-island (FI) sample mean exceeds core-area (CA) reference sample mean.

[6] Core-area reference sample mean exceeds fringing-island sample mean.

[7] Mann-Whitney U-test, two-tailed; * $P < 0.05$, ** $P < 0.01$.

[8] Core-area reference samples consist of all measured female or male specimens collected in Java.

[9] Excludes aberrantly large female (RMNH Coll. No. 1161, HB = 505, T = 440) included in Figure 27.

[10] Core-area reference sample consists of all measured female specimens collected north of 12.00°N.

[11] Core-area reference samples consist of all measured male specimens collected north of 5.70°N.

Appendix 9: Relative Tail Length (T/HB × 100) in Fringing-Island Samples of *Macaca fascicularis* Compared with Relative Tail Length in Core-Area Reference Samples Collected at Similar Latitudes[1]; Samples Include Both Sexes (cf. Table 11; Figs. 17, 18)

	Fringing-island samples				Core-area sample statistics				
		Sample statistics					FI >	CA >	
Island[2]	Latitude[3] (°N)	N	Mean ± SD[4]	Extremes	N	Mean ± SD	CA[5]	FI[6]	*P*[7]
Shallow-water islands									
West of Sumatra									
Tuangku	2.22	2	119.1	112.9–125.3	19	133.4 ± 11.80		×	> 0.10
Mursala	1.67	2	126.7	113.6–139.7	18	124.2 ± 9.76	×		> 0.20
Tanahmasa	−0.18	1	131.0		18	125.6 ± 9.83	×		> 0.20
Tanahbala	−0.43	1	132.5		18	124.6 ± 10.43	×		> 0.20
West of Isthmus of Kra and Malay Peninsula									
Kadan	12.50	1	95.2		12	98.0 ± 8.48		×	> 0.20
Zadetkyi	9.97	1	89.4		12	104.1 ± 14.94		×	> 0.20
Na Ka Yai	8.20	1	102.9		18	124.3 ± 13.39		×	> 0.20
Yao Noi	8.12	1	120.5		18	124.3 ± 13.39		×	> 0.20
Rang Yai	7.95	1	112.0		17	124.9 ± 13.54		×	> 0.20
Phi Phi Don	7.75	3	127.8 ± 1.54	126.7–129.6	16	127.3 ± 9.92	×		> 0.20
Talibong	7.25	2	117.1	115.4–118.9	16	127.3 ± 9.92		×	> 0.10
Tarutao	6.58	6	123.5 ± 7.60	112.2–135.1	14	127.7 ± 9.90		×	> 0.20
Langkawi	6.37	1	132.6		13	127.9 ± 10.27	×		> 0.20
Burau	6.35	1	119.3		13	127.9 ± 10.27		×	> 0.20
Pinang [1]	5.47	6	130.3 ± 8.52	122.1–144.1	26	122.6 ± 9.79	×		> 0.10
Pintu Gedong	2.92	2	123.8	122.2–125.3	18	130.3 ± 17.96		×	> 0.20
East of Sumatra									
Bengkalis	1.45	1	111.2		18	124.2 ± 9.76		×	> 0.20
Padang	1.37	1	114.1		18	124.2 ± 9.76		×	> 0.20
Singapore	1.42	3	122.4 ± 5.18	116.8–127.0	18	124.2 ± 9.76		×	> 0.20
Karimun	1.06	6	121.8 ± 11.93	101.7–136.5	19	124.9 ± 9.94		×	> 0.20
Kundur	0.88	1	136.5		19	125.2 ± 10.95	×		> 0.20
Durian	0.73	1	137.2		20	124.5 ± 9.82	×		> 0.20
Sugi	0.82	1	124.3		20	124.5 ± 9.82		×	> 0.20
Bulan	0.96	2	130.3	112.3–148.4	15	122.5 ± 9.39	×		> 0.20
Batam	1.12	2	123.2	118.4–128.0	19	124.9 ± 9.94		×	> 0.20
Galang	0.75	1	136.5		20	124.5 ± 9.82	×		> 0.20
Nguwal	0.65	1	134.7		20	124.5 ± 9.82	×		> 0.20
Bintan	1.15	6	114.9 ± 8.77	108.2–131.3	19	124.9 ± 9.94		×	< 0.05*
Mapur	1.00	1	135.4		14	122.4 ± 9.73	×		> 0.20
Bangka	−2.03	3	115.0 ± 14.89	98.4–127.2	20	117.8 ± 6.84		×	> 0.20
East of Isthmus of Kra and Malay Peninsula									
Phangan	9.75	2	107.9	102.8–113.0	14	106.9 ± 15.44	×		> 0.20
Samui	9.50	2	111.7	108.5–114.9	14	106.9 ± 15.44	×		> 0.20
Pinang [2]	5.73	2	139.6	139.2–140.0	24	123.1 ± 10.00	×		< 0.05*
Tioman[1]	2.80	8	106.2 ± 8.38	94.7–118.4	19	130.1 ± 17.49		×	< 0.002**
Acheh	2.67	1	140.2		18	130.2 ± 17.99	×		> 0.20
Pemanggil	2.58	1	131.1		16	136.2 ± 10.48		×	> 0.20
Aur	2.45	1	134.7		16	136.2 ± 10.48		×	> 0.20
South of Indochinese Peninsula									
Khram Yai	12.70	9	115.8 ± 5.72	109.2–128.2	18	97.1 ± 10.97	×		< 0.002**
Kut	11.67	5	110.1 ± 4.85	105.4–115.3	17	101.3 ± 14.52	×		> 0.05
Phu Quoc	10.22	1	102.3		14	106.9 ± 15.03		×	> 0.20
Con Son	8.72	4	115.0 ± 6.15	109.4–123.7	18	124.3 ± 13.39		×	> 0.05
Ba	8.65	2	119.6	111.9–127.3	18	124.3 ± 13.39		×	> 0.20
West of Borneo									
Siantan	3.13	2	120.7	113.0–128.4	19	129.3 ± 17.39		×	> 0.20
Laut	4.72	1	116.6		12	127.7 ± 8.64		×	> 0.20

Appendix 9: Continued

Island[2]	Latitude[3] (°N)	Fringing-island samples: Sample statistics N	Mean ± SD[4]	Extremes	Core-area sample statistics N	Mean ± SD	FI > CA[5]	CA > FI[6]	P[7]
Natuna Besar	3.78	1	107.9		15	125.4 ± 16.62		×	> 0.20
Lagong	3.60	1	133.4		20	127.0 ± 15.77	×		> 0.20
Subi-kecil	3.03	2	114.3	110.4–118.3	19	130.1 ± 17.49		×	> 0.10
Uwi	1.10	1	130.5		19	124.9 ± 9.94	×		> 0.20
Benua	0.95	1	129.4		15	122.5 ± 9.39	×		> 0.20
Karimata	−1.60	2	139.7	137.0–142.4	22	117.9 ± 7.03	×		< 0.05*
Serutu	−1.72	1	127.4		21	117.4 ± 6.86	×		> 0.10
Belitung	−2.93	2	98.9	98.9–99.0	18	117.5 ± 6.29		×	0.02*
South of Borneo									
Karimunjawa	−5.85	3	107.2 ± 5.59	101.1–112.0	20	114.1 ± 20.44		×	> 0.20
Bawean	−5.80	3	129.4 ± 11.96	122.1–143.2	20	114.1 ± 20.44	×		> 0.20
Matasiri	−4.78	1	124.1		16	111.9 ± 8.34	×		> 0.20
Bali[8]	−8.25	10	108.1 ± 9.98	87.2–125.8	29	109.5 ± 19.52		×	> 0.90
Northeast of Borneo									
Banggi	7.15	3	120.0 ± 2.41	118.1–122.7	16	127.3 ± 9.92		×	> 0.10
Deep-water islands									
West of Sumatra									
Katchall	8.00	1	115.2		17	124.9 ± 13.54		×	> 0.20
Little Nicobar	7.32	2	115.3	114.9–115.8	16	127.3 ± 9.92		×	> 0.10
Simeulue[9]	2.66	10	99.9 ± 5.99	89.9–108.0	18	130.2 ± 17.99		×	< 0.002**
Lasia	2.17	1	118.1		20	132.7 ± 11.98		×	> 0.20
Nias	1.22	10	112.3 ± 7.40	103.9–128.6	18	124.2 ± 9.76		×	< 0.002**
Lesser Sunda Islands[8]									
Penida	−8.75	1	100.9		29	109.5 ± 19.52		×	> 0.40
Lombok	−8.48	2	99.6	95.7–103.5	29	109.5 ± 19.52		×	> 0.20
Sumbawa	−8.56	5	104.8 ± 6.22	97.9–114.9	29	109.5 ± 19.52		×	> 0.40
Flores	−8.59	3	112.3 ± 15.13	95.1–123.6	29	109.5 ± 19.52	×		> 0.50
Sumba	−9.70	3	100.5 ± 10.34	90.7–111.3	29	109.5 ± 19.52		×	> 0.20
Timor	−9.57	1	70.4		29	109.5 ± 19.52		×	> 0.10
Philippines and Maratua									
Balabac	7.90	1	113.3		16	127.3 ± 9.92		×	> 0.20
Palawan	9.67	4	112.5 ± 9.42	104.3–124.4	14	106.9 ± 15.44	×		> 0.20
Culion	11.85	2	107.6	107.1–108.1	18	101.2 ± 13.35	×		> 0.20
Busuanga	12.07	1	126.2		20	99.8 ± 13.62	×		0.20
Mindoro	13.17	3	118.8 ± 9.02	111.5–128.9	18	97.1 ± 10.97	×		0.002**
Luzon[10]	16.44	4	120.6 ± 15.44	101.0–138.1	19	97.2 ± 10.68	×		< 0.01**
Negros	9.42	7	115.5 ± 7.75	105.1–126.4	14	106.9 ± 15.44	×		> 0.10
Mindanao	7.12	10	115.3 ± 12.00	95.7–130.3	16	127.3 ± 9.92		×	< 0.05*
Tawitawi	5.17	2	129.6	127.9–131.3	29	123.4 ± 9.61	×		> 0.20
Maratua	2.25	2	128.4	126.2–130.7	19	133.4 ± 11.80		×	> 0.20

[1] Mean latitude of core-area reference sample equals mean latitude of respective fringing-island sample; preferred size of core-area reference sample is 10–20. Excluded from this table are bobtailed specimens ZRC 4-127 (female, West Malaysia: P. Tioman, Telok Juara, T = 215, HB = 409, T/HB × 100 = 52.6) and BM(NH) 1955.1511 (male, Thailand: Ko Butang, T = 269, HB = 403, T/HB × 100 = 66.7).

[2] For details, see Appendix 2 and Fooden (1991, p. 34).

[3] Mean latitude of fringing-island sample localities (cf. Figs. 17, 18) negative numbers indicate latitudes south of the equator.

[4] Standard deviation specified where n > 2.

[5] Fringing-island (FI) sample mean exceeds core-area (CA) reference sample mean.

[6] Core-area reference sample mean exceeds fringing-island sample mean.

[7] Mann-Whitney *U*-test, two-tailed; * $P < 0.05$, ** $P < 0.01$.

[8] Core-area reference samples consist of all measured specimens collected in Java.

[9] Excludes aberrantly large female (RMNH Coll. No. 1161, HB = 505, T = 440, T/HB × 100 = 87.1) included in Figure 27.

[10] Core-area reference sample consists of all measured specimens collected north of 10.00°N.

Appendix 10: Blood-Protein Allele Frequencies at Polymorphic Loci in 11 Geographic Samples of *Macaca fascicularis*

Loci[2] and alleles[3]		Sample areas: Thailand, North of Isthmus of Kra: Central and southeast (*121*)	Thailand, North of Isthmus of Kra: Southwest (*124*)	Thailand, South of Isthmus of Kra (*33*)	West Malaysia (*140*)	Sumatra (*276*)	Java (*222*)	Bali (*136*)	Lombok (*35*)	Sumbawa (*81*)	Timor (*7*)	Philippines[4] (*142*)
Plasma proteins												
Alb	A	0.840	0.201	0.518	0.939	0.903	1.000	1.000	1.000	1.000	0.929	1.000
	B	0.160	0.799	0.482	0.061	0.081	0	0	0	0	0.071	0
	C	0	0	0	0	0.008	0	0	0	0	0	0
	D	0	0	0	0	0.008	0	0	0	0	0	0
Alp	A	1.000	0.997	1.000	1.000	1.000	1.000	0.989	1.000	1.000	1.000	0.972
	B	0	0	0	0	0	0	0.011	0	0	0	0.028
	*	0	0.003	0	0	0	0	0	0	0	0	0
ChEs	1	1.000	1.000	1.000	1.000	1.000	0.993	1.000	1.000	1.000	1.000	1.000
	5	0	0	0	0	0	0.007	0	0	0	0	0
Pi[5]	A	0	0	0	0	0.008	0.005	0	0	0	0	0
	B	0.182	0.011	0.954	0.543	0.816	0.686	0.221	0	0.790	0.643	0.919
	C	0.818	0.883	0.046	0.457	0.176	0.309	0.779	1.000	0.210	0.357	0.081
	D	0	0.106	0	0	0	0	0	0	0	0	0
TBPA	F	0.894	0.978	1.000	0.846	0.935	0.973	1.000	1.000	0.519	1.000	0.944
	S	0.106	0.022	0	0.154	0.065	0.027	0	0	0.482	0	0.056
Tf[6]	*	0.034	0.089	0	0	0	0	0	0	0	0	0
	B1	0	0	0	0.011	0.016	0	0	0	0	0	0
	B2	0	0	0.067	0	0.004	0.023	0	0	0	0	0
	C1	0	0	0	0	0.002	0	0	0	0	0	0
	C2	0	0	0	0.057	0.201	0.111	0.004	0	0	0	0.007
	C3	0.039	0.237	0	0.043	0.024	0.097	0	0	0.605	0.571	0
	*	0.191	0.157	0.033	0	0	0	0	0	0	0	0
	*	0	0.004	0	0	0	0	0	0	0	0	0
	*	0.005	0	0	0	0	0	0	0	0	0	0
	D1	0.015	0.085	0.617	0.736	0.616	0.579	0.004	0.029	0.395	0.429	0.993
	D2	0.324	0.127	0	0.025	0	0.007	0	0	0	0	0
	*	0.069	0	0	0	0	0	0	0	0	0	0
	E1	0.025	0	0.017	0.047	0.002	0	0	0	0	0	0
	E2	0.172	0.237	0	0	0.007	0.011	0	0	0	0	0
	*	0.025	0.008	0	0	0	0	0	0	0	0	0
	F1	0	0	0	0.004	0	0.016	0.011	0.143	0	0	0
	G1	0.088	0.017	0.200	0.036	0.011	0.005	0	0	0	0	0
	G2	0.005	0.013	0.050	0.004	0.016	0.138	0.982	0.829	0	0	0
	H1	0.010	0.025	0.017	0.036	0.101	0.014	0	0	0	0	0
	H2	0	0	0	0.004	0	0	0	0	0	0	0
Erythrocyte proteins												
Acp	A	0.969	0.993	0.971	0.964	0.996	1.000	1.000	1.000	1.000	1.000	1.000
	C	0.031	0.007	0.029	0.036	0.004	0	0	0	0	0	0
ADA	2	1.000	0.915	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.993
	5	0	0	0	0	0	0	0	0	0	0	0.007
	*	0	0.085	0	0	0	0	0	0	0	0	0
AK	1	0.962	1.000	0.972	0.979	1.000	1.000	1.000	1.000	1.000	1.000	0.919
	2	0.038	0	0	0.004	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0.081
	4	0	0	0	0.011	0	0	0	0	0	0	0
	5	0	0	0.028	0.007	0	0	0	0	0	0	0
CA-I	a	0.991	0.951	1.000	0.964	0.975	0.993	1.000	1.000	1.000	1.000	1.000
	b	0.010	0.049	0	0.021	0.004	0.002	0	0	0	0	0
	c	0	0	0	0.014	0.021	0.005	0	0	0	0	0

Appendix 10: Continued

Loci[2] and alleles[3]		Sample areas: Thailand: North of Isthmus of Kra: Central and southeast (*121*)	Thailand: North of Isthmus of Kra: Southwest (*124*)	Thailand: South of Isthmus of Kra (*33*)	West Malaysia (*140*)	Sumatra (*276*)	Java (*222*)	Bali (*136*)	Lombok (*35*)	Sumbawa (*81*)	Timor (*7*)	Philippines[4] (*142*)
CA-II	a	0.612	0.536	0.177	0.392	0.463	0.164	0	0	0.111	0	0.609
	b	0.388	0.464	0.823	0.608	0.537	0.836	1.000	1.000	0.889	1.000	0.391
CellEs	1	1.000	1.000	1.000	0.989	0.996	0.968	1.000	1.000	0.803	0.857	0.954
	3	0	0	0	0.011	0.004	0.032	0	0	0.074	0	0
	4	0	0	0	0	0	0	0	0	0.124	0.143	0.046
Dia	A	0.247	0.477	0.071	0.082	0.010	0.005	0	0	0	0	0
	C	0.715	0.439	0.929	0.914	0.990	0.995	1.000	1.000	1.000	1.000	1.000
	H	0	0	0	0.004	0	0	0	0	0	0	0
	*	0.039	0.084	0	0	0	0	0	0	0	0	0
EsD	1	1.000	1.000	1.000	0.996	1.000	1.000	1.000	1.000	1.000	1.000	0.944
	4	0	0	0	0.004	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	0.056
HbA-I[7]	1	1.000	1.000	0.951	0.989	0.996	1.000	1.000	1.000	1.000	1.000	1.000
	4	0	0	0.049	0.007	0.004	0	0	0	0	0	0
	5	0	0	0	0.004	0	0	0	0	0	0	0
HbA-II[7]	0	0.991	1.000	0.332	0.378	0.129	0.694	0.989	0.971	0	0	0
	2	0.010	0	0.668	0.622	0.872	0.306	0.011	0.029	1.000	1.000	1.000
HbB	1	1.000	1.000	1.000	1.000	1.000	1.000	0.967	1.000	1.000	1.000	1.000
	6	0	0	0	0	0	0	0.033	0	0	0	0
IDH	1	0.474	0.394	0.513	0.800	0.902	0.648	0.154	0.571	1.000	0.857	0.993
	2	0.526	0.606	0.487	0.193	0.087	0.350	0.846	0.429	0	0.143	0.007
	3	0	0	0	0	0.004	0	0	0	0	0	0
	4	0	0	0	0.007	0.007	0.002	0	0	0	0	0
LDHA	1	0.941	0.972	1.000	1.000	0.979	1.000	1.000	1.000	1.000	1.000	1.000
	3	0.059	0.028	0	0	0.021	0	0	0	0	0	0
PGD	A	0.983	0.929	0.971	0.921	0.904	0.986	1.000	1.000	1.000	1.000	1.000
	C	0	0.071	0	0.079	0.096	0.012	0	0	0	0	0
	I	0	0	0	0	0	0.002	0	0	0	0	0
	*	0.017	0	0	0	0	0	0	0	0	0	0
	*	0	0	0.029	0	0	0	0	0	0	0	0
PHI	1	1.000	0.829	1.000	0.986	0.977	1.000	0.985	0.971	1.000	1.000	0.813
	5	0	0	0	0.011	0.023	0	0	0	0	0	0.187
	13	0	0	0	0	0	0	0.015	0	0	0	0
	14	0	0	0	0	0	0	0	0.029	0	0	0
	19	0	0	0	0.004	0	0	0	0	0	0	0
	*	0	0.171	0	0	0	0	0	0	0	0	0

[1] Based on data provided by Dr. Y. Kawamoto (letter, 5 May 1992); cf. Tomiuk (1989a, p. 90) and Schmitt et al. (1990, p. 96). Sample size indicated by italicized figures in parentheses.

[2] Abbreviations: Acp = acid phosphatase, ADA = adenosine deaminase, AK = adenylate kinase, Alb = albumin, Alp = alkaline phosphatase, CA = carbonic anhydrase, CellEs = esterase, ChEs = cholinesterase, Dia = NADH-diaphorase, EsD = esterase D, HbA = hemoglobin alpha-chain, HbB = hemoglobin beta-chain, IDH = isocitrate dehydrogenase, LDHA = lactate dehydrogenase-A, PGD = 6-phosphogluconate dehydrogenase, PHI = phosphohexose isomerase, Pi = protease inhibitor, TBPA = thyroxin-binding prealbumin, Tf = transferrin.

[3] Asterisks (*) indicate electrophoretically distinct alleles that have not yet been designated by letter or number.

[4] Island or islands unknown.

[5] Cf. Tanaka (1991, p. 47) and Samilchuk and Sarsaniya (1994, p. 357).

[6] Cf. Hoopes (1984, p. 171).

[7] Cf. Tomiuk (1989b, p. 96).

Appendix 11: Monthly Distribution of Recorded Reproductive Events in Natural Populations of *Macaca fascicularis*[1]

Study area	Study period: Years	Study period: Months	Reference[2]	Copulations: Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total	Pregnancies: Jan.	Feb.	Mar.	Apr.	May
Bangladesh, southeast	1982–1983	Sep.–Feb.	*1*																		
Thailand, west	1967	Feb.–Apr.	*2*															4	1		
Thailand, south	1973	Jun.–Jul.	*3*																		
West Malaysia, northwest	1978	Oct.–Dec.	*4*																		
	1979	Jan.–Oct.															1	5	3	3	26
West Malaysia, central	1974	Jul.–Dec.	*5*									← increase →				?					
	1975	Jan.–Dec.											← increase →			?					
West Malaysia, southwest	1978	Oct.–Dec.	*4*																		
	1979	Jan.–Oct.															2	1	10	1	14
	1980	Jul.–Dec.																			
	1981	Jan.–Dec.															3		5	2	7
	1982	Jan.–Mar.															10	2			
Singapore	1922	May	*6*																		1
Sumatra, 2°–4°N	1972	Sep.–Dec.	*7*																		
Sumatra, Ketambe	1973	Jan.	*7*																		
	1980	Jan.–Dec.	*8, 9*	5	8	11	83	33	8	29	1	8	2	1	13	202[4]					
	1981	Jan.–Dec.[5]		34	54	50	39	8								185[4]					
	1982	Jan.–Dec.[6]				7	7	6	5	4						29[7]					
	1983–1984	Jan.–Jan.[8]		3	3											6[7]					
	1985	Jul.–Dec.	*10*																		
Sumatra, 0°–2°N	1907	?	*11*																		←
	1972	Jul.–Aug.	*7*																		
Sumatra, 0°–2°S	1972	Apr.–Aug.	*7*				← 1 →									1					
Sumatra, Gunung Meru[10]	1980	Jun.–Oct.	*12*						←	287		→				287					
	1981	Jul.–Sep.	*13, 14*							←	82	→				82					
	1982	Jul.–Sep.								←	44	→				44					
	1983–1984	Jul.–Jan.	*14, 15*									←	275	→	[11]	275					
	1984	Jan.–Dec.	*14*																		
Sumatra, 2°–4°S	1972	Feb.–Apr.	*7*		1	1										2		2			
Sumatra, > 4°S	1971–1972	Nov.–Jan.	*7*														2				
Bangka[12]	?	Jan.–Dec.	*16*														7	1			
Borneo, north	1950	May–Aug.	*17*																		
Borneo, Kutai	1971	Jul.–Aug.	*18*							← 3 →						3					
	1974–1976	Oct.–Jun.	*19*	+	+	+	141	+	+	+	+	+	+	+	+	486[13]					
	1982–1983	Jun.–Sep.	*20*																		
	1984	May																			
Java[14]	1909	Oct.	*21*																		
	?	?	*22*																		
Bali,[14] Ubud[10]	1978	Jul.	*12*																		
	1980	Sep.–Oct.																			
	1986	Jul.–Aug.	*23*							← 169 →						169					
Palawan	1962	Apr.–May	*24*																	1	
Luzon	1907	Feb.–Mar.	*24*																2		

Appendix 11: Extended

Study area	Year	Pregnancies								Births													Inferred birth peak
		Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total	
Bangladesh, southeast	1982–1983																	← 3 →		← 4 →[3]		7	–
Thailand, west	1967								5		1	1										2	Mar.–May
Thailand, south	1973											1										1	–
West Malaysia, northwest	1978					4	5	1	10														?Jan.
	1979	32	12	5	2	1			90							5						5	Jul–Aug.
West Malaysia, central	1974																						?Apr.
	1975																						?May
West Malaysia, southwest	1978					9	15	1	25										1		4	5	?Dec.–Jan.
	1979	16	17	7	4	2			74	2	1	3		2	4	2			1			15	?Jun.–Aug.
	1980		1	3	5	4		1	14								3	2				5	?Aug.–Dec.
	1981	4	2	3	4		2		32	1				4	1		2		1			9	May–Jul.
	1982								12		1											1	–
Singapore	1922								1														–
Sumatra, 2°–4°N	1972																		2			2	–
Sumatra, Ketambe	1973									1												1	–
	1980													2		2	4	3	7	2	2	22	Oct.
	1981										1					25	15	10	5	5	3	64	Jul.
	1982									2	1	1		2	1	3	3	5	4	4	4	30	Sep.
	1983–1984									2[9]			1		5	9	7	7	4	1	1	37	Jul.
	1985															←			13	→		13	Jul.–Nov.
Sumatra, 0°–2°N	1907	—	+	→					?						←			+		→		?	Jun.–Nov.
	1972															2						2	–
Sumatra, 0°–2°S	1972												←	3 →								3	–
Sumatra, Gunung Meru[10]	1980					1			1				2	1	3	4			2			12	Jun.–Jul.
	1981															1	1					2	–
	1982																1					1	–
	1983–1984																		2		1	3	–
	1984									4	3	3	5	1	1		3	2	2	1	1	26	Jan–Apr.
Sumatra, 2°–4°S	1972								2		11											11	–
Sumatra, > 4°S	1971–1972								2	2												2	–
Bangka[12]	?			1	3	13	10	8	43														Jan.–Apr.
Borneo, north	1950			1					1														–
Borneo, Kutai	1971																						–
	1974–1976																						Oct.
	1982–1983									1	1											2	Jan.–Feb.
	1984													> 1								> 1	May
Java[14]	1909					1			1														–
	?														1		1					2	–
Bali,[14] Ubud[10]	1978															2						2	–
	1980																	1				1	–
	1986																						–
Palawan	1962								1														–
Luzon	1907								2														–

←

Appendix 11: Footnotes

[1] Arrows indicate that data were reported for a multimonth period.

[2] Key to references: *1,* M. A. R. Khan & Wahab, 1983, p. 104. *2,* Fooden, 1971, p. 26. *3,* Fooden, [1975], p. 99. *4,* Kavanagh & Laursen, 1984, pp. 24–25. *5,* Aldrich-Blake, 1980, p. 151. *6,* F. N. Chasen, ZRC 4-089, specimen tag. *7,* Crockett & Wilson, 1980, pp. 172–173. *8,* van Noordwijk, 1985, pp. 280–281. *9,* van Schaik & van Noordwijk, 1985b, p. 539. *10,* Karssemeijer et al., 1990, p. 276. *11,* Moszkowski, 1909, p. 6. *12,* Koyama et al., 1981, pp. 2, 3, 8. *13,* Norikoshi, 1984, p. 13. *14,* Koyama, 1985, p. 113. *15,* Koyama, 1984, p. 35. *16,* Zuckerman, [1933], p. 1063. *17,* Davis, 1962, p. 58. *18,* Kurland, 1973, p. 258. *19,* Wheatley, 1982, pp. 210–211. *20,* Berenstain, 1986, p. 258. *21,* O. Bryant, Coll. No. 1049, USNM field catalog. *22,* Hoogerwerf, 1970, p. 408. *23,* Wheatley, 1991, p. 171. *24,* Fooden, 1991, pp. 18, 20.

[3] Multimonth reporting period extends to February 1983.

[4] Figures indicate mean daily copulation vocalizations per month.

[5] Copulations study period January–March 1981.

[6] Copulations study period March–August 1982.

[7] Figures indicate consortships per month.

[8] Copulations study period January–February 1983.

[9] Includes one birth recorded in January 1984.

[10] Provisioned troops.

[11] Multimonth reporting period extends to 5 January 1984.

[12] Possibly includes data on a few specimens that originated in Java.

[13] Twenty-nine percent observed in April 1976.

[14] In a brief preliminary report, Angst (1975, p. 328) suggested that consortships occur throughout the year in Java and Bali, that copulations peak during the summer, and that births may peak in December–May.

Appendix 12: Subspecific Variation of Head and Body Length, Relative Tail Length, and Greatest Length of Skull in *Macaca fascicularis* (cf. Tables 8, 10, 15; Appendixes 7, 9; Fooden & Albrecht, 1993, p. 537)

	Adult females				Adult males			
Subspecies[1]	N	Mean	SD	Extremes	N	Mean	SD	Extremes
				Head and body length (mm)				
fascicularis	118	404.8	32.7	315–490	193	462.0	42.8	370–610
aurea	7	471.1	35.4	400–512	3	559.7	61.1	520–630
aur/fas/mul	12	429.2	51.4	354–545	1	440.0		
philippinensis	2	420.0		420–420	13	480.2	32.9	410–530
phil/fas	9	433.6	21.5	400–465	6	498.8	24.2	466–539
umbrosa	0				3	501.7	25.2	475–525
fusca[2]	4	398.8	50.7	325–440	6	478.3	14.4	460–495
lasiae	0				1	470.0		
atriceps	4	418.8	11.1	410–435	5	452.0	17.2	425–465
condorensis	1	380.0			5	449.8	17.6	435–480
tua	1	420.0			1	440.0		
karimondjawae	2	443.5		417–470	1	501.0		
TOTAL[3]	160	411.9	37.0	315–545	238	465.6	42.5	370–630
				Relative tail length (T/HB × 100)				
fascicularis	118	119.3	15.9	70–148	189	118.4	15.0	69–150
aurea	7	91.1	7.1	76–96	3	94.6	9.4	85–104
aur/fas/mul	12	101.7	10.9	79–115	1	120.5		
philippinensis	1	138.1			13	113.8	8.7	101–129
phil/fas	9	114.9	12.1	96–130	6	114.0	7.8	106–123
umbrosa	0				3	115.3	0.5	115–116
fusca[2]	4	103.5	4.6	98–108	6	97.4	5.9	90–105
lasiae	0				1	118.1		
atriceps	4	113.2	3.4	109–117	5	117.9	6.7	110–128
condorensis	1	123.7			5	115.1	7.0	109–127
tua	1	126.2			1	130.7		
karimondjawae	2	106.5		101–112	1	108.6		
TOTAL[3]	158	116.3	15.6	70–148	232	117.6	13.4	69–150
				Greatest length of skull (mm)				
fascicularis	340	98.80	4.86	84.0–119.2	328	116.81	6.90	97.4–138.1
aurea	9	108.54	6.62	98.5–116.2	6	128.50	2.41	125.7–132.3
aur/fas/mul	15	103.80	5.70	95.7–115.3	4	124.15	3.70	118.9–126.8
philippinensis	16	109.38	3.73	102.7–115.8	35	126.19	6.48	109.3–139.1
phil/fas	31	104.69	3.20	96.8–110.0	39	122.64	3.77	116.6–130.5
umbrosa	0				3	136.37	3.70	132.7–140.1
fusca	4	102.22	2.81	98.2–104.3	7	121.77	1.88	118.0–123.5
lasiae	0				1	121.40		
atriceps	4	102.05	2.81	99.4–105.8	5	115.86	2.91	113.3–119.3
condorensis	2	106.10		105.6–106.6	6	119.27	3.67	112.9–123.9
tua	1	111.20			1	119.00		
karimondjawae	2	107.60		106.0–109.2	2	127.15		125.0–129.3
TOTAL[4]	424	100.18	5.58	84.0–119.2	438	118.61	7.32	97.4–140.1

[1] Abbreviations: *aur/fas/mul* = *M. f. aurea*/*M. f. fascicularis* or *M. fascicularis*/*M. mulatta* contact zone; *phil/fas* = *M. f. philippinensis*/*M. f. fascicularis* contact zone.

[2] Excludes aberrantly large female specimen (RMNH Coll. No. 1161, HB = 505, T = 440, T/HB × 100 = 87.1) included in Figure 27.

[3] Excludes one female specimen (USNM 477847, Philippines: Busuanga I., HB = 420, T/HB × 100 = 126.2), subspecies uncertain.

[4] Excludes 15 female specimens and 16 male specimens, subspecies uncertain.

Subject Index

Index to Scientific Names

For macaque taxa, primary alphabetization is according to subspecific or specific name; for non-macaque taxa, primary alphabetization is according to generic name.